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Electrical World

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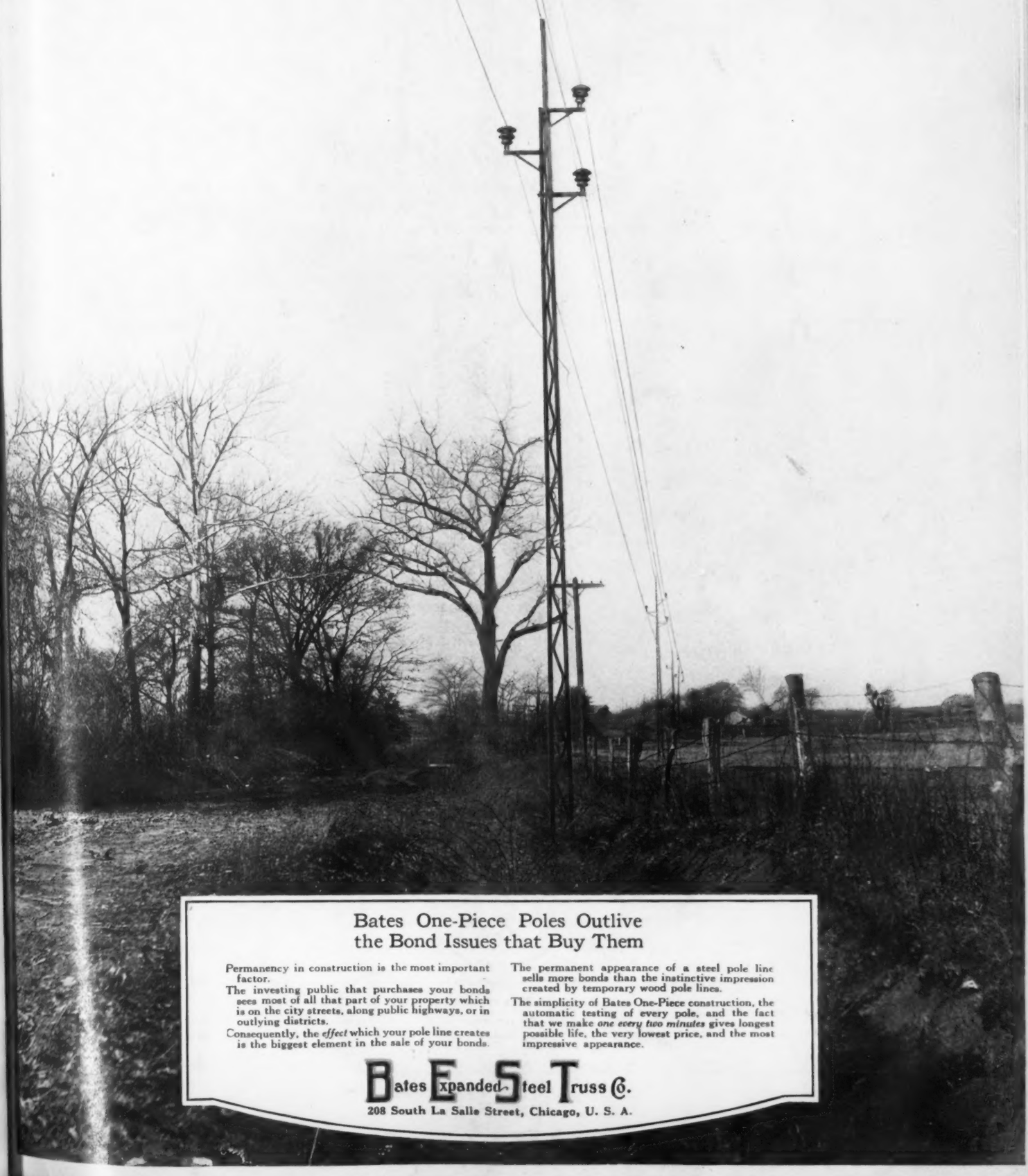

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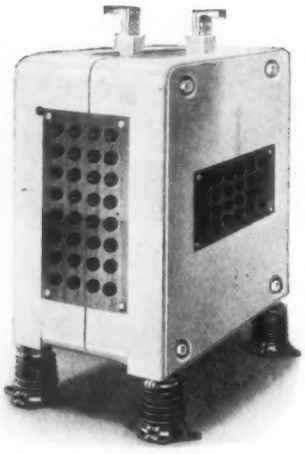

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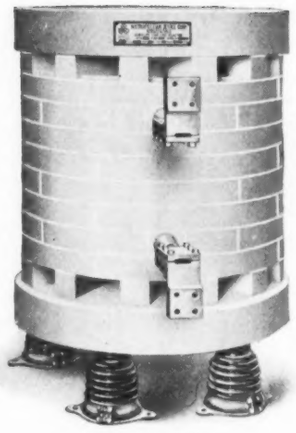

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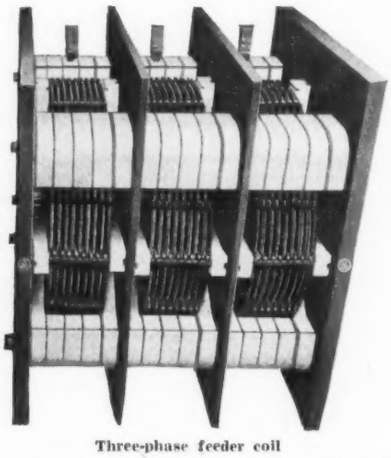

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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The Business of Radio

ONE short busy year ago there were some forty thousand radio receiving stations in this country. Today about one million people have installed wireless sets and are listening to the broadcasting, picking up bits of "commercial code" and taking the time from Arlington. In all the spectacular history of electricity there is no such story of phenomenal success.

The knowledge that the air was full of mysterious messages from distant ships fired the imagination of the American small boy. Radio became a juvenile fad. The broadcasting idea followed. Nightly now in all these countless homes a silent, unseen audience of young and old enjoys this service of music, lectures, sermons and news. Weather and crop reports are being sent out. Other ambitious innovations are in process. The President some day will talk direct to every household in the land. Such is the vision of radio.

NOW what is this to mean to the electrical business? The bulk of the apparatus and equipment will be made by electrical manufacturers. But who will distribute it? Who will retail it? Who will guide the evolution of this new opportunity? Will it grow great as another bond between the people and electrical men or as a thing apart?

The department store and the sporting-goods merchant first sensed the appeal and saw the profit. Wireless receiving sets, therefore, made their appearance in these shops, as a novelty. They sold immediately and the speed with which the market spread outstripped the factories. And when the bulk of the electrical dealers awoke, department stores were stocked and selling. The manufacturers were committed to them for months ahead. It was only by accident or good fortune then that other electrical dealers were enabled to provide their customers with this, for a time the most popular article of electrical merchandise.

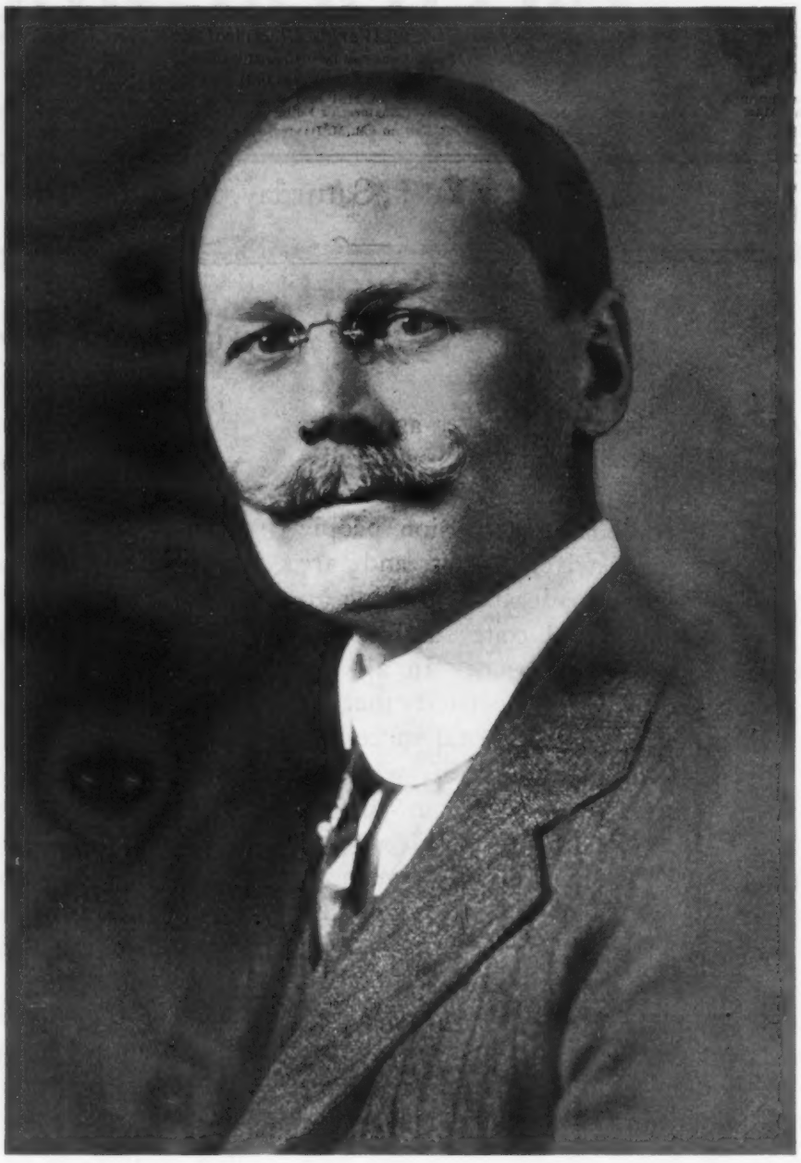
The budding radio business is now being organized into a working system. The controlling company announces that one hundred and fifty jobbers will be appointed to provide distribution. The electrical trade, they say, will be favored. And the electrical jobber is now scrambling to get up on the wagon.

But radio distribution means more than warehouses. It means constructive selling. It means the education of dealers. It means creative merchandising. It means progressive policies that are co-operatively sustained. The job must be done right.

THERE are many problems ahead in the development of radio—how to support broadcasting, the policing of the air. But the question that bulks biggest to the electrical man is this: Are we going to keep the radio *business* within the industry or let it slip away?

Valère Alfred Fynn

Designing engineer and inventor who has contributed largely to the development of the single-phase motor.



ONE of the underlying reasons why the electrical industry has been able to maintain its growth is that electrical apparatus and equipment are constantly being improved. To the designing engineer, therefore, must go a considerable share of the credit for the growth and development of the industry. In the list of designing engineers there stands out the name of V. A. Fynn, a consulting engineer of St. Louis, whose work relates to improvements of the alternating-current motor, especially the single-phase motor. He has taken out about 300 patents in nine different countries, about one-third of them having been granted in the United States, and as a result of his wide experience he has come to be recognized as an authority on patent matters.

In all probability his most important achievement was the solution of the problem of speed regulation of single-phase motors, published by him in 1905—a solution theretofore considered almost impossible. This he followed by a long series of inventions in this field, the development of a number of new motors and the improvement of existing types.

Mr. Fynn was born in Ireland April 11, 1870. He received his mechanical and electrical engineering education at the Swiss Federal Polytechnic in Zurich. The first three years after leaving college were spent with the Swiss manufacturers Brown, Boveri & Company in design, testing and erection work. Then, in 1895, he became chief electrical engineer for Easton, Anderson & Golden of London. During the four years he was thus engaged he designed and developed a line of alternating-current machinery, discarding the smooth-core armature then popular in England and substituting therefor armatures with slotted cores. Next he became chief engineer and soon afterward partner in the English firm of Rosling & Apperby. About this time he designed a unity-power-factor, single-phase commutator motor, which was built and operated in 1902. In 1903 the consulting engineering field claimed him. He set up offices in London, making a specialty of supplying designs to manufacturers and advising them in special work. His single-phase motors were manufactured by the Elektricitäts-Gesellschaft Alioth of Switzerland, France, Germany, Italy and Spain and the General Electric Company of England. In 1904 and 1905 he invented the induction and also the conduction self-excited, single-phase, adjustable-speed motors, and in the two following years he brought out a polyphase conduction adjustable-speed motor with phase compensation and a single-phase squirrel-cage motor with a high starting torque and unity power factor. In 1908 he came into close contact with the Wagner Electric Manufacturing Company of St. Louis, which took out licenses under almost all of his numerous patents and employed him in 1909 as consulting engineer. During the twelve years this connection lasted he devoted all his energies to it. He has since gone into independent consulting work again.

Mr. Fynn's work has always been characterized by originality. His perseverance and fundamental theoretical knowledge have enabled him to tackle successfully what others said could not be done. The originality of his theories is clearly evident in his frequent contributions to electrical literature both before British and American electrical engineering bodies and in the technical press. He is a fellow of the American Institute of Electrical Engineers and a member of the British Institution of Electrical Engineers.

Editorial Comment

Electrical World, March 25, 1922

Volume 79 Number 12

Get Ready for the Fishing Now

AN OLD-WORLD proverb says, "When you are not fishing you should be mending your nets." It is a bit of very practical advice which the central-station executive can use to good advantage now—the net in this case being his sales department. During the last few years of general business depression the utility selling organizations of the country have been badly demoralized. Some have been actually and totally abandoned; many have been cut to the bone; most have been reduced in size and support; all have been discouraged and weakened by protracted exposure to gloom and restricted opportunity. Now come the good tidings of better times.

There is a lot of mending to be done. More men and better men must be added to the selling staff and organized. Better and more productive policies must be devised and developed. Selling activity must be increased and extended. For there is business to be had right now—lots of it. More and more business lies ahead. But it is selling that sells, and waiting longer to get ready to begin only wastes good weeks that might as well be filled with profit and achievement. When the fish begin to run there won't be time to mend these nets.

The Actual Status of Financing Costs

ACCORDING to Samuel Insull, utility companies have not been so seriously damaged by the high cost of financing as many had been led to believe during the period of high prices. In a recent address, published in this issue, Mr. Insull submitted figures showing that the permanent cost of financing from the sale of senior securities for three of the Insull property groups averages less than 1 per cent. His remark that a business able to pay its stockholders a fair dividend and not able to stand such an increase as the result of the world upset could not be considered very stable is extremely pertinent.

Probably the greatest single handicap on business recovery today is the way in which the entire world has run wild in expenditures in the past few years. Industrial concerns have sunk tremendous sums in the construction of new plants at prices that were at the highest possible point. Extravagant expenditures have been made to care for business that at best could last only a few years. Personal expenditures by nearly every class of individuals have been on an impossible scale. The necessity of writing off the inflated values thus created has not only been a serious problem but will be a drag on business for some years to come.

Mr. Insull's utterance suggests the thought that utilities in general have to a very large extent been protected from the effects of inflation within the industry itself. Some of the experiences of the war were difficult and trying, particularly when the other fellow was making enormous profits and enjoying a perfectly good time. However, those hardships and annoyances may have been vastly less unpleasant than the payment that is being exacted from the business world today. The position of public utilities at the present time, following a few arduous years, is a gratifying one, and the hardships of the past must not be allowed to cloud the sky and hide the sun of new opportunity. There is some danger of this unless the ill-timed and ill-founded calamity howling that is being indulged in by a comparative few is brought to a halt.

Is the Coal Buyer Never to Have Peace?

THERE will be a coal strike. Of that there can be little doubt. The operators are unhappy over their small profits and are content to let it come. The miners feel that they have nothing to lose, because their living has been squeezed down to the bone. The radical element is in command. The public believes that we must pass through a series of psychological steps to bring the minds of the workers to a recognition of the unavoidability of a revision of the wage scale downward. The one charge that the workers have been able to make is that the operators have not been scrupulous in keeping to their contracts. But they will strike.

The time will come, we hope, when the people of America will realize that constant strife and disorganization in this great basic industry is a public menace and a common responsibility. The unending succession of strikes and lockouts, with the never-stopping talk of labor trouble, interferes with the peace of the home and the prosperity of business. Some day, some way, some authority will have to go into the inner heart of this distracted industry, uncover the sustaining causes of this costly chronic national affliction, and allow the curative influence of a little sunlight to heal this running sore.

One thing is patent to all thinking men, and that is that the economic status of the coal miner as he exists under the conditions of today is hopeless. You cannot look for contentment in a class of labor that is employed in some cases only 160 days in a year, no matter what the wage. For the sound of the inflated daily wage lures to the mines an oversupply of labor which gluts the market, and because too many men are put to work the intermittent employment cuts down the actual income of the worker below the living wage. The individual miner has too much money for a day's work, but too many days when there is no work. The result is discontent, dissension and waste.

The coal consumers of the electrical industry are in no immediate danger. Warning was ample, and there are comforting reserves of coal both at the power stations and the manufacturing plants. There are large waiting stocks at the mines. But what of the

future? Is the coal buyer never to have peace? It is time that large industry groups, such as the public utilities, began to make an organized demand upon the coal operators, upon the coal trade, upon labor and upon the government to put an end to this impossible situation by establishing a reasonable degree of economic security in the coal fields.

Ideal Procedure Established for Creating National Standards

THE procedure followed in conducting the recent conference on overhead-crossing specifications and also adopted for carrying out any necessary revisions therein should meet with universal approval and should serve as a precedent for creating any future national standards. The principal and essential feature of the procedure was that an opportunity was given to all interests to be represented in proportion to their scope. Another requirement, often overlooked, was that the purpose of the conference was announced sufficiently in advance to enable the representatives attending it to prepare an adequate presentation of their constituents' respective points of view. The practicability of the procedure was evidenced by the fact that a unanimous conclusion was reached without delay, despite the fact that considerable differences of opinion had existed prior to the conference.

In future conferences or committees of this kind it cannot be urged too strongly that the essentials just alluded to be observed. Furthermore, such arrangements must be made by the industries concerned that their constituents' opinions will be crystallized and made available to their representatives in the conference or committee. Equipped with this information and not bound by an unyielding attitude, conference committees should not have the difficulty in coming to an agreement that is usually experienced. Besides, the results of the conference will in this way be more nearly in conformity with the desires of the interests involved.

A Tale of Two Kittens and Its Application

PRIMARY school readers contain a short poem more remarkable for its wisdom than for its poetry. It is illustrated by a picture of a housewife sweeping two kittens out into the snow and begins thus: "Two little kittens one stormy night began to quarrel and then to fight." As for the rest of the poem we do not now recall it, but it does not matter. The housewife, exasperated by the antics of the kittens, seizes a broom and sweeps them out into the night. While the storm rages the kittens pass the time seeking shelter and trying to keep warm, each wondering all the while whether it will survive with all its nine lives intact. The tale has an application to the case of the lighting and telephone companies. In the large majority of cases the individuals concerned want to find an amicable solution of the inductive-interference and joint-use problems. Unfortunately there are some to whom the possible short-sighted advantage to be gained by insisting on fancied or so-called legal rights is of more importance than the mere matter of service to the public.

Back of all the bickering and sidestepping that is being done by individuals lies the simple fact that the one thing which must be accomplished is the greatest possible measure of service of all kinds with the lowest possible cost. Any fight which does not have as its ultimate aim the accomplishment of these two results is worse than foolish. The two branches of the industry have no rights to quarrel about except the right of each to help find the way to an amicable settlement of their mutual problems. The public is going to referee that fight, and if the contestants lose sight of the public rights they will both find themselves in an extremely unpleasant position. One of the results that may come is the forcing of lines under ground to eliminate both unsightly pole lines and in some measure the troubles due to inductive interference. The whole problem is a business one, but the "business" does not consist of a battle of wits to see which contestant can "do" the other. It lies in the ability of both to help each other to give the greatest possible measure of service with the least possible jangling.

The Analysis of Distribution Costs

WE PUBLISH in this issue the first report of the systematic investigation that has been made into the cost of distributing electrical supplies. A careful analysis has been made of the sales and operating expenses of five of the leading jobbing houses over a period of six months. The figures have been bulked and present a study of the cost of warehousing and selling electrical material, classified under a large number of heads. The development of these statistics has been policed by a committee of ten electrical manufacturers and certified to by an accounting firm of eminent standing. These findings can, therefore, be accepted as authentic and as typical of the best practice of the electrical jobbing industry as at present organized.

Any examination of this consolidated summary brings the inevitable conclusion that the electrical jobbing industry is suffering from a disease that must be fatal if a cure is not speedily found and applied. Many of the basic commodities sold through the jobbers' warehouse—the bread-and-butter business—are clearly costing more to handle and sell than they pay in profit. Many of the leading specialties appear in an even worse light. The number of bills sent out is appalling. The average total operating expense is very high. The average selling price per unit shipped is very low. The jobbers of this country are in the red. Here are some of the reasons.

In pondering these figures and the interpretation, however, one thing should be kept in mind. We must have distribution, and distribution must cost money no matter who is performing it. It is, after all, just a problem of getting the goods from the factory to the consumer, and whether the manufacturer sends them all the way, or whether the consumer or the retailer goes after them, or whether the manufacturer ships to a wholesaler who gathers a complete assortment of all lines and presents them conveniently to the local buyer, makes no difference. It is just distribution and it entails expense. The question is, which way is the most economical?

If the apportionment of the costs of distribution, as at present organized, is not in balance with the sharing of the profits among the several interests involved, then there must be a redisposition of those costs and profits

or else the system must break down. This analysis of jobbers' costs is the first step. It demonstrates statistically what has been well known through physical finance, that the jobbers are losing too much money distributing electrical supplies. Now the industry should go the rest of the way and find out what it is costing the manufacturer and the retailer to contribute their respective functions to the scheme of distribution. Then, on the basis of a full knowledge, the real problem can be worked out. And the real problem is to determine which *is* the most economical way to distribute electrical supplies of the various kinds, to locate present sources of waste and loss, and to perfect a set of policies that will prosper each rightful agency of distribution and at the same time provide a free market for all worthy goods and a full service to the public.

High Quality and Mass Production Possible with Electric Annealing

THE production of "quality" material under accurately controlled conditions is the service that usually "puts the electrical idea across" to the operator and owner of annealing ovens in a well-planned installation like that described by Alan Dauch elsewhere in this issue. When such high-grade work is duplicated over and over for fifteen months without a single rejection or overheating, the argument in favor of doing such tasks electrically is indeed a strong one; but when such a performance is accomplished at fuel cost (or its equivalent) no higher than would have been required by non-electric methods, it is clear that the electric oven has won the day.

The installation described anneals steel wire with as low an energy consumption as 115 kw.-hr. per ton on a twenty-four-hour cycle, which is equivalent to 230 pounds of coal on the assumption that one kilowatt-hour can be generated from two pounds of coal. A well-designed and efficiently operated coal-fired annealing furnace would consume from 225 pounds to 250 pounds of coal for annealing a ton of wire under similar conditions. Even on a ten-hour cycle, this installation has been running around 185 kw.-hr. per ton. Such figures are convincing, and when accompanied by references to the collateral benefits of electric heating constitute a challenge to advocates of the older combustion methods.

To anneal thousands of tons of product without one rejection means an accuracy of control difficult to approach except electrically. Over and over one sees in studying electric heating applications that the ability to repeat on *quality* of batches of work handled is of an importance not easily exaggerated from the producer's standpoint. Mass production means economy here as elsewhere, and certain particulars of the installation described by Mr. Dauch are of much interest from the standpoint of saving heat units in cooling one charge by absorbing them into the charge undergoing preheating, keeping down heat waste and cutting labor costs to the quick by the use of well-designed handling equipment and automatic temperature-control apparatus. It is no longer necessary to disturb a charge before heating is complete, since the even action of the electric oven surpasses that of the combusion type formerly used. In both electrical and mechanical lines the reader will find this installation well adapted to its work, and its record of reliability and economy of operation is extremely gratifying.

Induction-Generator Station Has Wide Field of Application

TO KEEP down investment and operating costs is one of the first essentials of successful development and utilization of small water powers. In work of this kind many things can be eliminated which engineers have become used to specifying as a matter of course in large plants. By using induction generators in certain cases, for example, a surprising amount of hydraulic and switchboard equipment, considering the size of the plant, can be omitted, and the attendance necessary to maintain good service can be kept within very reasonable bounds even where full automatic equipment is not provided.

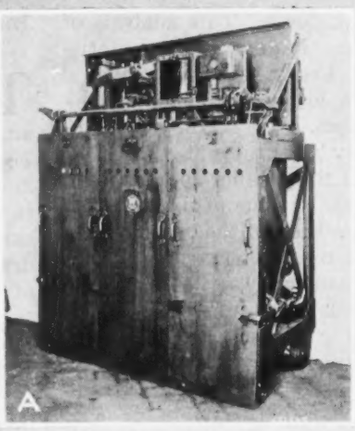
An interesting development by induction generators near Lee, Mass., which is interconnected with the Pittsfield Electric Company's Silver Lake steam plant, is described elsewhere in this issue. The development consists of two stations so situated on two watersheds as to permit operating one shed against the other, with resulting high economy in the use of runoffs. One plant has a head of 437 ft. and the other of 68 ft., the first having three 300-hp. and the second two 200-hp. induction generators installed with direct-connected waterwheels. Excitation current is furnished by the Pittsfield generators, and the governing problem, as the careful reader of the article on the Lee development will see, received close attention.

The behavior of induction generators above synchronous speed is a primary point of interest in plants of this type, and the working out at Lee of the governing arrangement and standardization of operating methods described will appeal to the engineer investigating this subject or operating induction-generator installations elsewhere. In normal operation the load on the induction generator is the only governor desired, but in case the excitation current is lost or the circuit opened, the runaway speed must be held down to safe limits. The governor equipment here installed closes from full-open position in from one and a quarter to one and a half seconds, and this means that the runaway speed of the motor dies down to within 2 per cent of the synchronous speed within ten or fifteen seconds. The governor supplies enough water to the wheel to maintain the motor at a slight overspeed, so that the resumption of loading as a generator is prompt after the circuit is closed and excitation current restored. Governing by deflection works out nicely, and the range of governor adjustment enables the operator to handle the plant most effectively under the different conditions that arise in daily operation.

The use of circuit breakers equipped with relays set for an overload of about 20 per cent and designed for a maximum time element of eight seconds (although about two seconds suffices) meets the condition of the motor's coming upon the line at slightly above its full-load speed as a generator. A very simple schedule of operating attendance suffices, and as it was not expedient to invest the money required for full-automatic service, simplification of equipment and moderate labor cost went hand in hand.

Altogether the various problems described appear to have been solved most creditably, and the test results given bear out the opinion that induction-generator plants intelligently installed have a real field in the conservation of scattered hydraulic resources in many parts of the world.

Truck-Type Switchboards Supplanting Permanent Structures in New Generating Stations and Substations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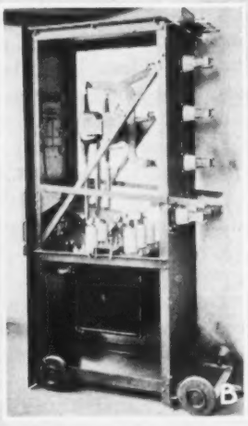
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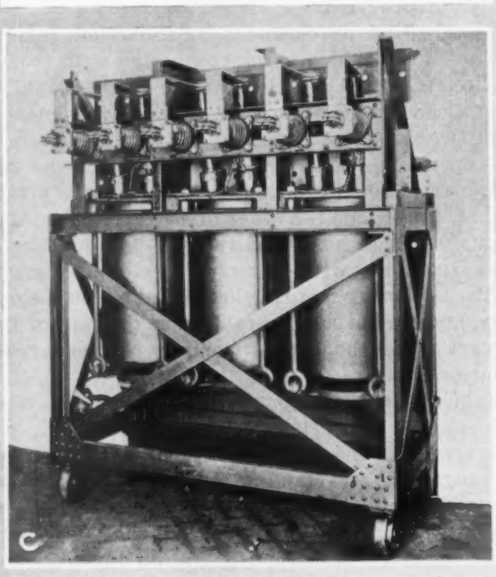
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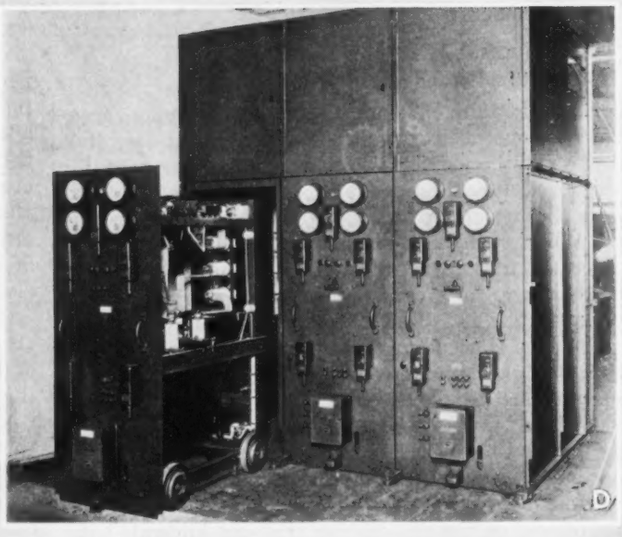
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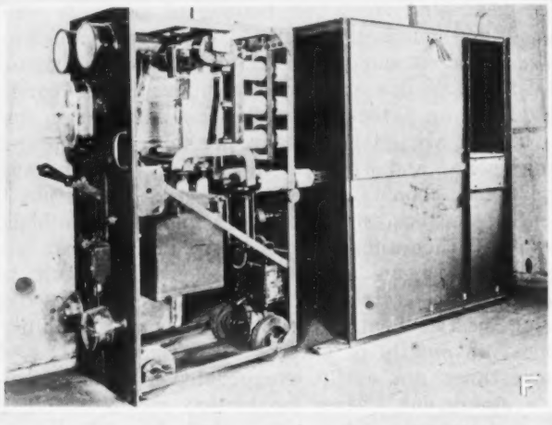
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TRUCK-TYPE switchboards have been used for several years in this country and much longer abroad for consumers' services and industrial plant installations, but it is only recently that they have been applied to any extent inside generating stations and substations. Three recent examples are the Hell Gate station and Ninety-seventh Street substation of the United Electric Light & Power Company and the South Meadow station of the Hartford Electric Light Company. In both generating stations the trucks are used for station service: in the substation they are used exclusively. Among their characteristics are safety to life and equipment, compactness, interchangeability, ease of installation, inspection and repair, and the fact that the trucks come ready for immediate use. Illustrations A and C show the front and back of a truck-type circuit breaker used by the United company, while E shows the type used by the Hartford company. Other types of trucks for central-station service are shown in B, D and F.

Inductive Interference Is Basically a Technical Problem

Other Problems Grow Out of Lack of Complete Control of Forces—Control Within Power and Signal Circuits Must Be Developed—Cost of Control Measures an Important Factor

THE inductive-interference problem so called is primarily a technical one. Its legal, business and public-policy phases are the outgrowth of the action of electrical forces that are susceptible of control only through the channels of technical research and the methods of design and arrangement of both telephone and power systems that will be the outgrowth of that research. It would be almost impossible to enumerate all the problems that must receive a technical solution. Part of them are known; many of them will only be revealed by further study and the developments of years yet to come. It is possible, however, to state the fundamental elements of these problems.

SOME BASIC CONSIDERATIONS

Because the effects that have been embarrassing to the electric transmission or the signal companies have taken the form of troubles on signal circuits, some of the elementary facts involved have been lost sight of. Inductive interference has come to mean the inductive effects that are observable as the result of operating signal and power circuits parallel to each other. It will be instructive, therefore, to consider the nature of the circuits that are involved. Two electrical circuits placed side by side will react on each other if each is energized by a varying electric current. The reactions will obviously vary in strength as the currents causing the reactions vary. In metallic circuits the reactions can be counteracted to a degree by proper transpositions. If the circuits are of the ground-return type—that is, of the kind using one wire and the earth to form the two sides of the circuit—such control measures are impossible and there is no really practical way in which the reactions between circuits can be effectively controlled. The familiar cross-talk in the ordinary type of ground-return telephone circuit is an illustration of this type of interference and the difficulty of controlling it. The ground return makes the circuit sensitive to the influence of a paralleling circuit and invites induction. This is true regardless of the nature of the circuits. To counteract this difficulty as between circuits of the same character, the signal circuits in some classes of important commercial service have been made metallic and elaborate transposition systems have been worked out to counteract the inductive effects on each other from the minute currents used in these types of circuits. Some classes of signal circuits are inherently more sensitive than others, since requirements in the art have tended to make them more and more sensitive. Signal circuits with their connected apparatus are therefore inherently sensitive. They can be made more sensitive to inductive influences from outside sources, or by adopting measures within the signal systems themselves they can be rendered less sensitive.

A power circuit is not sensitive to the inductive influence of paralleling circuits unless the effects reach values that are beyond the practical range that such effects now reach. This is because the magnitude of an induced current in a power circuit is ordinarily of such small value that it cannot have an appreciable effect on the current regularly carried for service purposes. In place of being sensitive to induction from outside sources, therefore, the power circuit exercises an inductive influence on other circuits which it may parallel. The extent of this influence is dependent on the character of the power circuit itself and the apparatus connected to it. On the other hand, it is possible so to construct the power circuit as to increase or decrease its influence on neighboring circuits. For example, the use of a circuit with one wire and the ground forming the two sides of the circuit will increase the inductive influence of the circuit on neighboring circuits. The use of apparatus of certain characteristics in connection with power circuits can have the same effect.

It is therefore evident that both signal and power circuits possess characteristics that must be controlled in any practical solution of the inductive-interference problem. In the case of the signal circuits the characteristic to be brought under control is its sensitiveness to inductive influence. In the power circuits the tendency to influence other circuits inductively must be controlled. Around these two facts as a basis the technical considerations are grouped.

PRESENT STATUS OF PROBLEM

The California inductive-interference rules are the most definite that have yet been worked out. Other states have adopted rules, but they have based their work almost altogether on that of the California committee, which was a joint committee in which were represented all the interests involved. A review of the final rules recommended by that committee, in so far as they affect physical property of communication and power systems, shows that the avoidance of parallels, discontinuities, material and workmanship, transpositions, suitability of apparatus, methods of operation to reduce interference, balance of circuits and operating rules and records covering abnormal conditions are presented in a mutually corrective form. There is a decided tendency, however, particularly in the matter of transpositions and operating rules and records covering abnormal conditions, to generalize as far as the communication system is concerned and be more specific regarding the power system. Specific rules as to the arrangement and spacing of power circuits, the avoidance of high-frequency components in rotating machinery, transformer connections, the use of rectifiers, switches, fuses, electrolytic arresters and special instruments, records of neutral current, operation of transformers at overvoltage, and care in operating matters are included, but apply to power systems only.

One rule relating to the selection of apparatus in the communication system calls, as far as practicable, for insuring an accurate balance of series impedances and admittances to earth of the two sides of the circuit. This rule is general in character.

FUNDAMENTAL PROBLEMS TO BE CONSIDERED

In mentioning the California report it is not intended to discuss the merits or demerits of the remedies specified. It is certain that the work of the committee was well done and that the electrical industry cannot afford to lose the value of that work. It is intended to point out definitely that the treatment of the subject is almost entirely one-sided, and that in the rules proposed the specific requirements are devoted largely to the power system, with general statements as to the measures required on the part of the communication system. This suggests four questions requiring serious technical consideration:

1. What measures for the control of the sensitiveness of signal circuits to inductive influence, both as between themselves and in their relation to paralleling power circuits, can be applied to the circuits and inside signal circuit plant that will not unnecessarily restrict the service they give or prevent legitimate development of that service to the best interests of the public?
2. What will the costs of such measures mean in the cost of signal service to the public?
3. What measures can be adopted within power systems to control the tendency to influence inductively other circuits, either of their own type or signal circuits, without unnecessarily restricting the service they give or preventing legitimate development of that service to the best interests of the public?
4. What will the cost of such measures mean in the cost of power service to the public?

Taken together, the four questions suggest a fifth that forms the final of the purely fundamental questions on which all of the technical research work must be based. It is: "With the problem worked out as indicated in these four questions, how can the control measures within each of the systems be co-ordinated with the measures in the other system to insure the greatest possible efficiency of both classes of service with the minimum of restrictions on either and on the future development of both?"

DEVELOPMENT OF CONTROL REQUIRES TIME

The form of the questions might indicate that a large number of detail problems must be worked out, set down and balanced in reports before it is possible to arrive at the solution of any one of these problems. This is not only untrue, but an unpractical way of looking at the situation. The electrical industry, while in general beyond its pioneer state, is in a period when development along many lines will be more rapid than it has ever been because some of the fundamental research work that was necessary during the early development period is done. The industry has a broader, surer foundation on which to build, and development will proceed correspondingly. The two phases of the industry that are concerned principally in the problem are in a state of flux that will allow of no certain prediction of conditions a few years hence. It is not at all impossible that many ideas of the problem prevalent today will not fit the conditions of tomorrow. The technical work must therefore proceed a step at a time, building on the foundation of current practice and co-ordinating the present facilities of both signal and power systems to give the best possible service. The work will therefore be concerned with a comparatively few problems at any one time, but over a period of time the list may present a bewildering and kaleidoscopic change.

Of the immediate detail problems that the technical men must face, the one in need of most attention is that presented by the preference for separation suggested in the California rules to prevent inductive interference. The solution is an ideal and, like many ideals, is not approachable because of practical conditions. Country roads and city streets are seldom over a hundred feet in width. The largest mileage is probably 60 ft. or less in width. The separations needed to obtain the ideal solution are far beyond these limits. While certain classes of circuits of extreme importance, such as heavy toll leads, steel-tower transmission lines and similar construction, must, for other reasons, seek private rights-of-way, the solution as a general one is impracticable for either class of service, except when, as in the case of some classes of service, the circuits can or must follow a railway or similar right-of-way. These cases are restricted in number.

In the final analysis of the problem the electrical industry must face the possibility of all highways being used to give the public it serves the services that it has to offer. That public will not be satisfied if the industry simply says that it cannot do the job. Some way must be found to do it efficiently and therefore economically and effectively. The services that the electrical industry has to offer the public are too vital as factors in progress to permit of any hint of failure. Technical men have not failed in other and even bigger tasks. They cannot fail in this one.

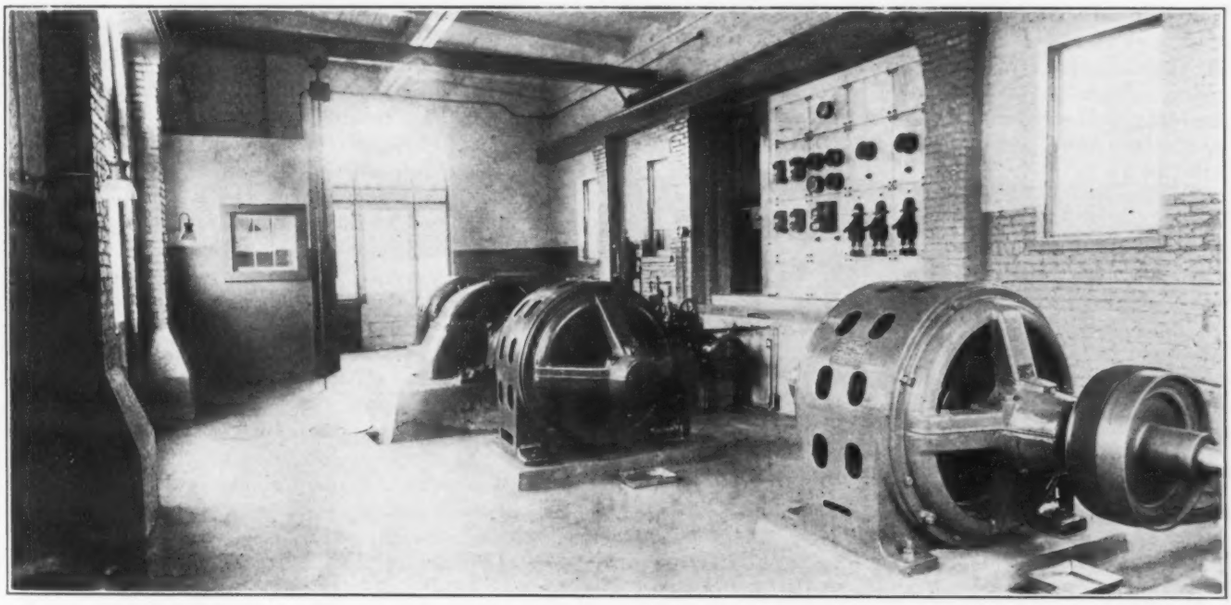
Progress of Electrical Interconnection in Great Britain

THE great "electric chain," which is the ultimate objective of the British Electricity Commissioners, seems likely to make an early start in Lancashire. An important scheme is on the point of completion there which will have the result of connecting up the wide industrial area between Accrington and Preston and embracing the busy manufacturing districts en route. The Blackburn Corporation has put the finishing touches to its new station at Whitekirk—the first superstation since the war—the total cost of which is more than £750,000. The proposal now is to authorize a large electrical extension at Accrington on the one hand and Preston on the other, the two towns being connected up with Blackburn's new works by special cables the cost of which is to be borne by Blackburn and Accrington and by Blackburn and Preston respectively.

There is more in the scheme than meets the eye, for it means that, with the exception of a small stretch, there will be a connected cable established between Colne, on the Yorkshire border, and Preston, at the mouth of the Ribble. Blackpool has a project which, if carried through, would result in the cable being extended to the west coast. This move has advanced beyond the theoretical stage. Definite schemes are already in operation, and before the end of the year it is expected that mills, workshops, dwelling houses and even agricultural areas will be in a position to obtain power for either machinery or lighting. The cable between Blackburn and Preston is to cost £138,000.

Use of Small Water Powers Simplified by Induction-Generator Plant

Quick Run-Offs and Stored Water Alternately Utilized by Two Stations of This Type Which Are Connected with Nearby System—Methods of Handling Design Problems and Results of Tests



SIMPLICITY AND SEMI-AUTOMATIC FEATURES OF THIS STATION REMOVED ECONOMIC BARRIERS TO DEVELOPING 900 HYDRO-ELECTRIC HORSEPOWER NEAR LEE, MASS.

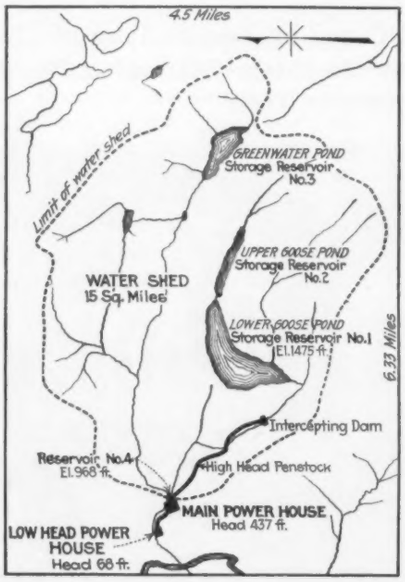
NUMEROUS, widely scattered small water powers exist in the United States which have remained unutilized up to the present time because of the expense of developing the power, operating the plants and transmitting the energy to a market. These economic obstacles can be removed to a great extent, as has been pointed out before by various engineers, notably Dr. C. P. Steinmetz, by installing automatic induction-generator stations and tying them in with a larger station or system. Recently a practical application of this suggestion has been made by the Tayford Company, Inc., near Lee, Mass., where two induction-generator stations are interconnected with the Lee and Pittsfield electric service systems.

A watershed with a total area of about 15 sq.miles (39 sq.km.) is utilized, the two generating plants, operating under gross heads of 437 ft. (133 m.) and 68 ft. (20 m.). The former or main head is associated with a pond representing about 225 days of storage, and the latter head is utilized below the first station and in hydraulic series with it. The flow from the high-head wheels discharges into a small reservoir of negligible storage, and this tailwater and the water from the lower portion of the drainage area are combined and used at the lower power house. There are in reality two watersheds, one of which is operated against the other.

During spring flows and after rainstorms a quick run-off is received from the lower shed and is used at the lower-head station. At such times this station does the greater part of the work, the wheels at the high-head plant being partly shut down, thus saving water in the ample storage above. Under the reverse condition, the low-head plant supplies a small amount of power and the high-head station does most of the work, drawing on storage. This stored water when released from the high-head wheels supplies the major portion of water required to run the low-head station. In the latter case the high-head plant does about 75 per cent of the work. To suit the above conditions, the low-head station was developed to about 400 per cent of its average horsepower capacity.

The high-head station is served by a 7,300-ft. (2,225-m.) machine-wound wooden penstock ranging from 24 in. to 28 in. (60 cm. to 71 cm.) in diameter. From the intercepting dam, where it originates, the penstock drops gradually for about one half its length, then rises to within 50 ft. (15 m.) of the elevation of its intake, and then drops away, gradually at first and finally more rapidly where it runs down hill to the power house. At its high midpoint is installed a 10-in. (25-cm.) air vent running up the side of the mountain. From the lower end of the penstock a steel header connects through three 10-in. (25-cm.) inlets to three 350-hp. Pelton waterwheels, designed for 410 ft. (125 m.) net head. These units are of the single-runner type with two nozzles each and deflector control. Directly connected to the wheels are three General Electric induction generators each rated at 300 hp., 600 r.p.m. (synchronous speed), three-phase, 2,300 volts, 60 cycles. The rotors

are of the squirrel-cage type. To guard against a runaway speed in case of lost excitation a speed-limiting governor acts on the deflector of the water jets, thus limiting the speed to a few per cent above the synchronous value when the line is de-energized. As a result no severe jolts are caused when the line is re-energized. The necessary exciting current is furnished by synchronous steam-turbine units in the Pittsfield Electric Company's Silver Lake plant, which is tied into the Lee asynchronous stations by a trunk line.



RUN-OFF WITHIN THIS WATER SHED IS ECONOMICALLY UTILIZED BY TWO INDUCTION GENERATOR STATIONS

The low-head station contains two 200-hp. wicket-gate-type turbines directly connected to two 200-hp. induction generators, which are otherwise similar to the machines in the high-head station. The low-head plant is fed by a 42-in. (106-cm.) wood-stave continuous penstock, 1,650 ft. (502 m.) long.

In considering the type of equipment to use it was recognized that operating costs should be reduced to the minimum and that the class of labor required should be non-technical. Equipment not easily mishandled and at least semi-automatic was necessary. It was felt that an automatic synchronous generating station for a plant of this size would require too many relays and too much auxiliary apparatus needing technical attention and adding greatly to the cost of installation. The induction-generator plant appeared best for the situation, and experience has justified the choice.

The length of penstock and head involved led to a selection of the Pelton type wheel with deflector hood for use with the induction generators in the high-head station. The question of preventing dangerous racing in case of losing the excitation current influenced the solution of the governing problems. With an induction-generator floating on a single circuit of a distributing company, it is possible for the motor to lose its exciting current much more frequently than a synchronous generating unit will lose its total load at a multi-circuit station. It appeared important that the overspeed governor should operate from full open to full closed positions in as short an interval as possible. This quick operation of the governor, except as it deflected the water jet, would involve grave water hammer on a 7,300-ft. (2,225-m.) penstock even in case relief valves were connected with the governor or other precautionary measures used. Hence it was decided to get along without the possible higher efficiency of the Francis type of wheel and use an impulse wheel with deflector hood cutting into the jet as an arrangement less likely to give trouble.

In normal operation the load on the induction-generator is the only governor desired, and at any time the load being carried determines its speed, so long as the circuit on which it floats is closed. It has been found that with a synchronous speed of 600 r.p.m. and a full-load speed of 585 r.p.m. the motor will generate its full rating at a little below 615 r.p.m. Experiments to ascertain this fact were made during the early construction at Lee, as available data seemed scarce. The synchronous speed of the motor was determined by bringing the motor up to a speed that would move a watt-hour meter disk neither forward nor backward. It was found that this point could be determined within one or two revolutions per minute by accurate adjustment. By increasing the speed the motor would take on load as a generator in consistent ratio with the increased speed.

The governor used is the Pelton type F, which in this installation closes from full open position in from one and a quarter to one and a half seconds from the time of throwing out the circuit breaker. This means that the runaway speed of the motor dies down to within 2 per cent of the synchronous speed within ten or fifteen seconds. The governor supplies enough water to the wheel to maintain the motor at a slight overspeed, and thus it is ready to take on load again as soon as the circuit is closed and excitation current restored. A slow opening of the governor follows. The essentials of the governor here are quick action from full to no load and an easy possible adjustment of the governor by hand to vary the speed at which it will operate by 5 or 10 per cent outside the theoretical speed for which the governor is designed. This is necessitated by fractional changes in the frequency on the line upon which the induction-

PERFORMANCE OF THE GENERATING UNITS AT LEE (MASS.) INDUCTION-GENERATOR PLANT WITH DIFFERENT ADJUSTMENTS OF WATERWHEEL NOZZLES

Units Nos. 1 and 3 are rated at 300 hp., 2,300 volts, 600 r.p.m. (synchronous speed), whereas No. 2 is rated at 250 hp. All of the waterwheels are identical in design.

Condition of Nozzles		Unit No.			Unit No.			Unit No.			Unit No.			Unit No.		
Needle Nozzle	Plain Nozzle	1	2	3	1	2	3	1	2	3	1	2	3	1	1	3
		Kw.			R.P.M.			Amp.			Average Voltage			Power Factor		
¼ turn	closed	...	...	...	593	594	593	17.5	16.5	17.6	2,135	2,110	2,110	....	....	....
1 turn	closed	...	16.4	...	...	594	...	...	17.6	...	...	2,120	...	...	...	...
2 turn	closed	39.5	45	44.1	596	595	595	24.2	23.1	23.1	2,135	2,140	2,135	44	53.7	52
3 turn	closed	...	70.7	...	...	597	...	...	28.1	...	...	2,140	...	...	54	...
4 turn	closed	87.7	91.5	92.5	598	598	599	33	31.9	32.5	2,155	2,160	2,165	71.5	68	77
5 turn	closed	103.5	109.5	111	599	599	600	35.2	35.8	36.2	2,190	2,170	2,175	78	75.5	84
6 turn	closed	119	124.5	126	600	602	601	40.2	39.6	39.6	2,170	2,150	2,150	79	82	84
closed	open	118	118	116.2	600	602	601	38.5	39.6	38.0	2,170	2,150	2,170	81	86.5	81.5
2 open	open	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4 open	open	204	204	206	604	610	605	59.5	62.5	62.5	2,205	2,210	2,215	77.5	86	86.5
5 open	open	216	216	217	605	610	605	65.5	64.5	65	2,205	2,215	2,195	86.5	87.5	88
6 open	open	226	228.5	224.5	606	612	606	68	68	67	2,210	2,215	2,200	87	87.5	88
8 open	open	234	...	...	606	...	...	71	...	...	2,220	...	...	86	...	...
10 open	open	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11¼ open	open	240	240	238	607	614	608	73	70	70	2,220	2,225	2,215	86.5	89	89

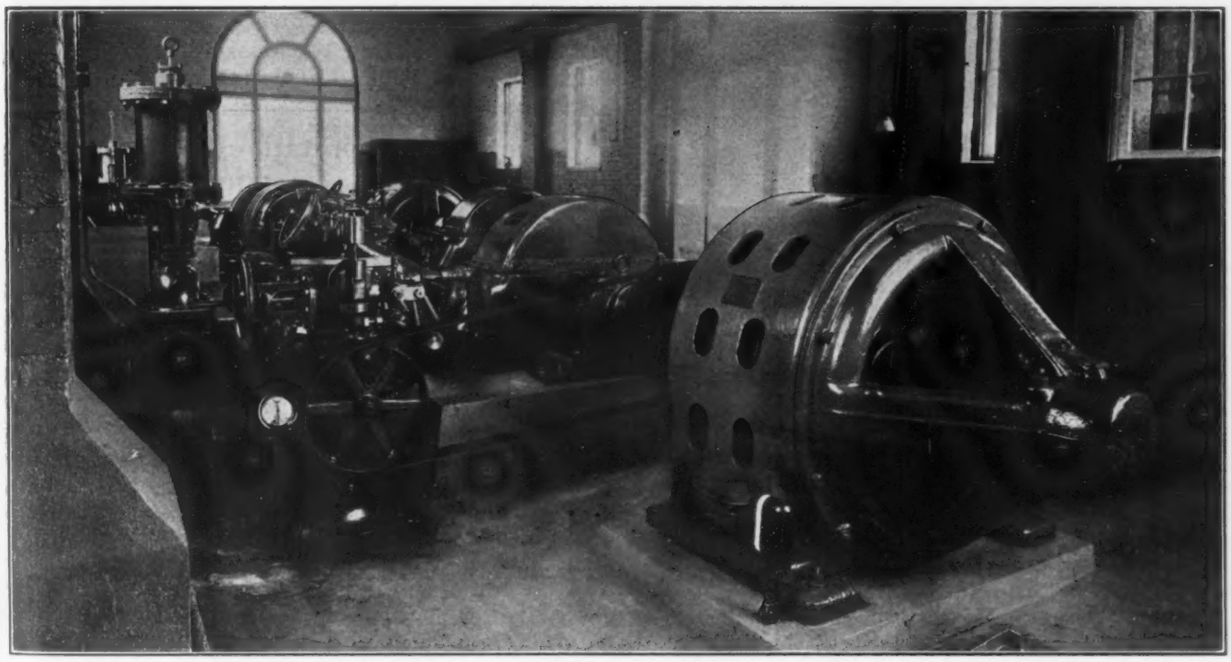
generator is floating and by the need of setting the governor for the speed required to take on loads.

The governors include a dash-pot mechanism which is controlled by a milled wheel clearly visible in one of the accompanying illustrations. By adjusting this wheel the water can be entirely deflected from the waterwheel buckets, or the speed can be brought up to 10 per cent above synchronous value. This is one of the essential requirements of the governor.

The lower nozzle of two of the units in the high-head plant is not equipped with a valve but the upper nozzle of all three units has a needle valve. The lower nozzle of the second unit can be cut off by an 8-in. (20-cm.) geared cut-off valve if desired, so that the middle unit can be run at less than 50 per cent capacity with rated efficiencies. Thus the plant can be operated at any point from zero load to full capacity and units arranged for any load so that a consistent efficiency can be obtained for various load conditions. The generators are directly connected to the waterwheels by flexible couplings of the pin and leather bushing type which allow the generator to center itself in its field and also permit the waterwheel runner to center itself with respect to the water jets.

The accompanying table gives the results of some tests on these units. The data show that at synchronous speed and with theoretically no power produced or consumed, about 17.5 amp. excitation current was required. This current increased at a decreasing rate as the machine output grew larger. The similarity in results for all three machines is notable. For low flows No. 1 unit developed less power that the corresponding units owing to a bent spindle of the needle nozzle. When No. 2 unit, which includes a generator which was designed as a 250-hp. motor based on the 40-deg. rating, was operated at the rating of the other two machines, namely, 300 hp., the speed rose some six points above that of the other machines for the same load. In other words, the slip at 20 per cent overload as a motor is converted into a corresponding increase in speed as a generator. The increase of power factor with load is also of interest.

The design of circuit breakers for this class of work gave the engineers of these plants something of a problem. If a motor to be operated as an induction generator is thrown upon the line below synchronous speed, the machine first takes current from the line to come up to synchronous speed as a motor, the motor driving the waterwheel for the time being. Under these conditions there is a rush of current from the line corresponding to the starting of an induction motor under load, and the line is subjected to a temporary surge with clearly apparent effect on lighting service. On the other hand, if the motor is thrown upon the line at exactly synchronous speed or very slightly above it, no effect is evident and no change of speed is audible. When thrown upon the line at considerably above synchronous speed the hum of the generator drops to a much lower pitch, and if this speed is too high, the breaker will at once release. A no-voltage-release switch would be inapplicable, since if the line voltage were lost through opening of the circuit, the breaker would be released and the generator would not take load upon closing of the outside circuit.

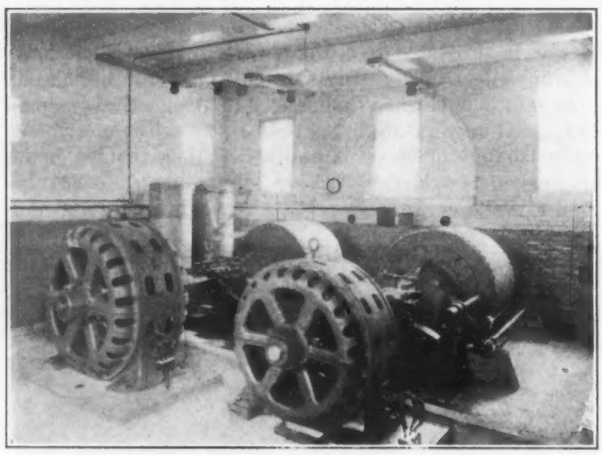


THE GOVERNOR CONTROL IS AN IMPORTANT FEATURE OF THIS INDUCTION-GENERATOR STATION

By equipping the breaker with an overload release or an inverse-time-limit relay, which will withstand the shock of the motor's coming upon the line at slightly above its full-load speed as a generator, satisfactory results are attained. These relays are set for an overload of about 20 per cent and are designed for a maximum time element of eight seconds, although about two seconds is all that is required. The switchboards of the two plants are equipped with Westinghouse apparatus, such as oil switches, meters and watt-hour meters.

The operation of the plants is simple. By opening one of the waterwheel nozzles the set is brought up to synchronous speed (determined merely by sound), and the line switch is then closed. This brings the machine quickly to synchronism. The second nozzle is then opened, oversynchronizing the set to an amount required by the load. Considered in more detail, the

waterwheel is brought up to synchronous speed by a careful adjustment of the milled wheel on top of the governor which holds the speed at, say, 600 r.p.m. After the machine has taken its load the milled wheel is turned until the governor is entirely backed off the wheel. Then the milled wheel is screwed down to a point where the governor will just take hold and finally back again about three-quarters of a turn. This amount of leeway has been found to be just sufficient at this



LOW-HEAD INDUCTION-GENERATOR STATION DEVELOPING 400 HP. NEAR LEE, MASS.

plant to allow for fluctuations in frequency, and does not cause the deflector to intercept the jet except in case of loss of magnetizing current.

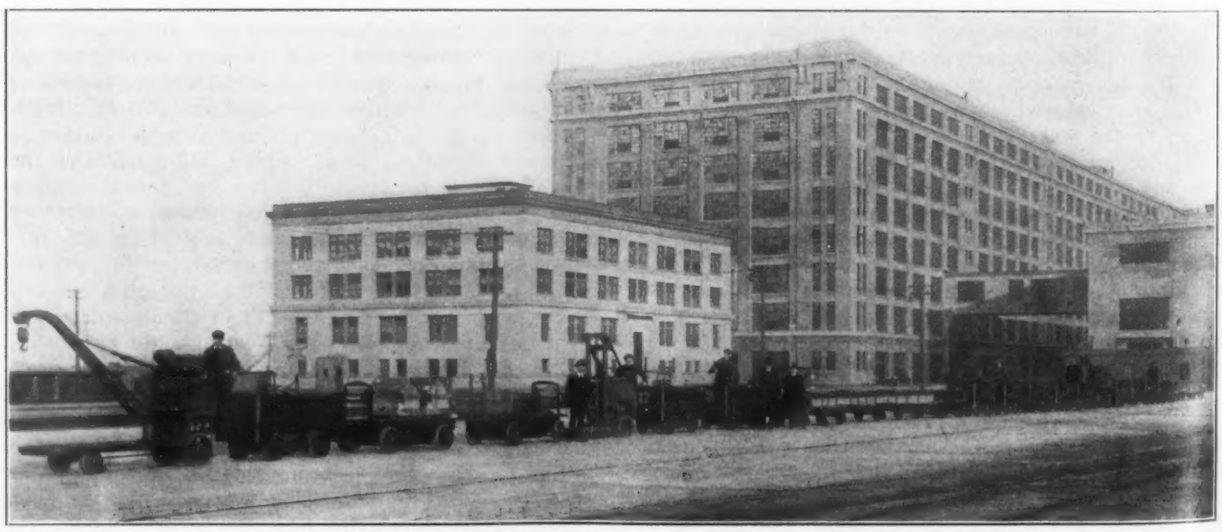
Although provision is made to control and read the load conditions of the low-head station at the high-head plant, there is no co-ordination of operation between these induction-generator stations and the steam station with which they are connected electrically. The steam-station operator can always ascertain if the induction-generator stations are on the line by the exciting current which they draw. The only way in which the steam station can interfere is through the radical fluctuation in generator speed and corresponding frequencies, which would have to be instantly imitated at the induction-generator stations. Compensation for such action can be gained by adjustment of the milled governor wheel previously mentioned. In case a transmission line is going to be de-energized the induction-generator station attendant is notified.

The two induction-generator plants are being successfully operated with two mechanics and a general supervisor who is called upon when necessary. The day shift of the day operator is broken so as to extend his period for a considerable part of the day without involving continued periods at which the plant receives no attention. The night operator leaves the plant at 8:30 a.m. The day operator comes on at 10 a.m., leaves at noon, returning at 1:30 p.m. and remaining until 6 p.m. He returns at 7 p.m., leaving at 10:30 p.m., and the night operator takes charge at midnight. The total labor cost of operating the plants is $2,500 per year. In severe winter it is probable that about $100 extra labor will be required in connection with plant heating, removal of snow and ice.

The data for the above article were obtained through the courtesy of Henry W. Taylor, consulting engineer and erector of the plant, 154 Nassau Street, New York City, and Arthur Palme, Pittsfield, Mass.

Electric Transportation Equipment Equivalent to 500 Men

THE transportation capacity of the equipment shown in the accompanying photograph is easily sufficient to equal the working powers of 500 men in the local movement of material. The Quartermaster's Intermediate Depot at Boston, built during the world war to expedite shipment of supplies overseas, was also designed to permit the commercial utilization of these facilities under suitable agreement with the United States government. The present equipment of the Base consists of one lifting-platform "Automatic" tractor, two flat-platform Yale industrial trucks, two Elwell-Parker lifting-crane tractors and twenty-two Baker R. & L. tractors, with several hundred trailers. In handling material through the storehouse and wharf shed, each 1,638 ft. long, eight and three stories high respectively, and the pier shed, 900 ft. long and three stories high, this equipment, supplemented by electric cranes, constitutes a means of expediting local transportation equaled in few installations thus far made.



ELECTRICITY TAKES PLACE OF MEN IN HANDLING MATERIALS

A Study of Jobbers' Sales and Costs

An Analysis of the Sales and Operating Expenses of Five Jobbing Houses Made Public by the Electrical Supply Jobbers' Association

By EARL E. WHITEHORNE
Commercial Editor ELECTRICAL WORLD

THE Electrical Supply Jobbers' Association has just made public a six months' analysis of sales and operating expenses covering five of the foremost jobbing houses of the country. The figures appear in the accompanying table. Late in 1920 the jobbers' association made an appropriation for an investigation of the cost of doing business, and five of the largest, most efficient and representative houses were designated for study. These five houses are widely scattered so that the influence of varying local conditions is well provided for. A two months' test was taken and the results were analyzed. Some of the facts presented were so unexpected and so disconcerting in their inference that a number of manufacturers with whom these conditions were discussed questioned the possibility of their being accurate. So it was suggested that a committee of ten leading manufacturers be appointed to police the investigation, and to establish its authenticity beyond question, the accounting firm of Niles & Niles was retained to have supervision over the organization and conduct of the work, checking and certifying to all figures.

The consolidated summary presented here embraces total figures classified and segregated under forty-one different heads, being the leading lines of materials or groups of similar character. It shows the net sales of each class by these five houses for this period of six months, dividing them into sales and material carried through the warehouse and also direct shipments from the factory, and it shows the percentage of the total sales represented by each class of goods. Against this it spreads out clearly the character and extent of the operating expenses involved in the selling of each line and the percentage of the selling price that is eaten up. It gives some most pertinent statistics as to the number of bills and credit memos that are made out in the course of selling these goods, the number of items on the bills, the average amount of these items, the number of units shipped and called for and the average selling price of these units shipped and called for. These figures do not include any overhead charge for interest on investment.

SURVEY MADE UNDER ADVERSE CONDITIONS

A little study of these figures will develop some startling comparisons. Before making these deductions, however, it is well to bear in mind a few of the conditions under which this survey was made. In the first place these figures were obtained in the first six months of last year, which was a period of extreme depression and low volume of business. They are therefore conservative, but it was agreed that it would be better to make the test at such a time rather than to have the slightest possibility of doubt that they might show conditions better than they really are. The report therefore undoubtedly shows higher costs than it would have in 1920, yet the industry faces a good many years of falling market, and though the improvement of business both in volume and in character is already manifest, a conservative attitude toward the cost and value of sales is justified.

The important consideration is that though these figures might show some variation in different times and as applied to different houses, the relative values would remain the same. The comparative costs of selling different classes of material would stand true, and this is the most valuable lesson in the whole analysis. In short, it shows which kinds of electrical materials are the most economical to sell and the most expensive to sell and in this way points out which classes of business are the most profitable. Out of this must come the realization that certain lines must be sold in some other way by the present distributers, or through some other channel of distribution, for obviously a line that cannot be sold by the jobber, as at present handled, without a direct loss on every item sold cannot be permanently distributed that way. Such a conclusion is inevitable.

OPERATING EXPENSES EAT UP PROFIT

Attention is called, for instance, to item No. 1, which is wiring devices. This is one of the prime staples that have always been looked upon as part of the bread and butter business. About 80 per cent of it passes through the warehouse. It totals 6.66 per cent of the total sales. But the operating expense included in handling these wiring devices figured 20.59 per cent, and every jobber and every manufacturer of this material knows that there is not this much profit for the jobber in this line. In other words, every time a socket or a switch was sold out of those houses they lost money. A third of a million dollars was bulked in sales of wiring device, and they made out 17,858 bills and credit memos to take care of it. All this work and all this business and they lost money over it, in not one house but five, and not for one month but six.

Heating devices stand as a line which has been pushed hard, backed by tremendous pressure of publicity, supported by great dealer interest and a growing popularity. These five jobbers sold $167,467.93 worth of heating devices, almost $25,000 worth a month each, and it totaled 3.37 per cent of their whole sales. But it required 10,337 bills and credit memos to handle it, and because a good many parts are sold the average selling price per unit was only $3.31, and it cost 25.95 per cent of the selling price for operating expenses, and nobody made a cent on the business because there is not that much gross profit in the business.

In the same way flashlamps, batteries and cases bulked 0.63 per cent of the business, but it cost 29.21 per cent to sell, which is more than it pays. And porcelain knobs, tubes and cleats, 0.92 per cent of sales, cost 31.70

A Consolidated Summary of Sales, Operating Expenses and Statistical Data by Commodities Based on a Study of Five Electrical Jobbing Houses Located in Different Sections of the Country*

AN ANALYSIS EMBRACING THE SIX MONTHS ENDED JUNE 30, 1921

		Net Sales				Operating Expenses												
		Warehouse and Called For	Direct	Total	Per Cent of Total	Financial and Accounting	Per Cent to Sales	Selling	Per Cent to Sales	Warehouse	Per Cent to Warehouse and Called-For Sales	Total	Per Cent to Sales	Bills and C/M Issued, Number	Items on Bills and C/M Issued	Average Amount of Items on Bills and C/M Issued	Units Shipped and Called For	Average Selling Price of Units Shipped and Called For
1	Wiring devices	$268,405.61	$63,028.18	$331,433.79	6.66	$17,191.68	5.19	$30,139.81	9.09	$20,907.03	7.79	$68,238.52	20.59	17,858	41,183	$8.05	165,768	$1.62
2	Rubber-covered wire and lamp cord	255,980.89	135,006.89	390,987.78	7.86	9,064.89	2.32	23,245.00	5.95	12,522.86	4.89	44,832.75	11.47	7,832	15,287	25.58	33,977	7.53
3	Weatherproof wire	83,165.80	122,060.78	205,226.58	4.13	2,831.68	1.38	8,212.60	4.00	3,121.81	3.75	14,166.09	6.90	1,506	2,508	81.83	4,561	18.23
4	Bare copper wire	12,261.47	49,651.61	61,913.08	1.24	744.48	1.20	4,418.99	7.14	554.79	4.52	5,718.26	9.24	292	341	181.56	547	22.42
5	Rigid conduit	123,211.92	45,480.24	168,692.16	3.39	3,225.02	1.91	8,383.15	4.97	7,798.92	6.33	19,407.09	11.50	2,352	5,938	28.41	31,118	3.96
6	Other conduit fittings	41,039.59	7,818.00	48,857.59	.98	4,348.41	.90	8,397.86	17.19	7,555.30	18.41	20,301.57	41.55	4,445	13,379	3.65	71,183	.58
7	Porcelain knobs, tubes and cleats	39,301.94	6,609.96	45,911.90	.92	1,807.79	3.94	6,701.54	14.60	6,044.60	15.38	14,553.93	31.70	1,809	4,309	10.65	90,810	.43
8	Conduct-type fittings	66,948.08	10,219.62	77,167.70	1.55	5,791.14	7.50	9,602.12	12.43	7,855.85	11.73	23,249.11	30.13	5,489	18,010	4.28	59,765	1.12
9	Large "Mazda" lamps											†75,199.46	12.20					
9	Large "Mazda" lamps	591,150.37	25,249.86	616,400.23	12.39	13,842.42	2.25	38,026.47	6.17	18,536.75	3.14	70,405.64	11.42	12,065	23,478	26.25	58,872	10.04
10	Flashlights, batteries and cases	24,867.43	6,393.80	31,261.23	.63	2,684.50	8.59	4,110.81	13.15	2,337.30	9.40	9,132.61	29.21	3,403	6,683	4.68	17,018	1.46
11	Fans	104,745.08	12,446.89	117,191.97	2.36	2,176.84	1.86	9,429.27	8.05	4,496.58	4.29	16,102.69	13.74	2,059	2,773	42.26	5,562	18.83
12	Inclosed fuses	18,194.80	5,216.61	23,411.41	.47	1,484.20	6.34	2,910.89	12.43	1,368.39	7.52	5,763.48	24.62	1,658	3,193	7.33	11,480	1.58
13	Renewable inclosed fuses	29,266.27	1,701.91	30,968.18	.62	1,585.61	5.12	3,287.18	10.61	2,238.62	7.65	7,111.41	22.96	1,526	3,531	8.77	15,913	1.84
14	Flexible metallic conduit	39,714.68	4,255.37	43,970.05	.88	1,204.31	2.74	2,922.63	6.65	2,147.28	5.41	6,274.22	14.27	1,183	2,380	18.47	7,652	5.19
15	House goods	20,112.30	9,391.94	29,504.24	.59	2,104.47	7.13	3,564.10	12.08	2,124.83	10.56	7,793.40	26.41	2,585	4,470	6.60	15,240	1.32
17	Tools	11,775.45	5,522.46	17,297.91	.35	1,492.76	8.63	2,578.88	14.91	1,557.43	13.23	5,629.07	32.54	1,474	2,672	6.47	4,010	2.94
18	Metal molding and fittings	8,036.33	3,278.26	11,314.59	.23	684.82	6.05	2,113.24	18.68	1,133.14	14.10	3,931.20	34.74	698	2,208	5.12	6,515	1.23
19	Watt-hour meters	7,245.17	22,615.59	29,860.76	.60	614.31	2.06	2,369.58	8.03	474.69	6.55	3,485.58	11.67	430	581	51.40	602	12.04
20	Non-metallic flexible conduit	49,353.44	2,076.72	51,430.16	1.03	1,269.51	2.47	4,565.35	8.88	2,775.61	5.62	8,610.47	16.74	1,193	2,280	22.56	7,919	6.23
21	Tape—rubber and friction	26,935.92	10,074.66	37,010.58	.74	1,771.08	4.79	3,694.86	9.98	2,358.76	8.76	7,824.70	21.14	2,067	4,245	8.72	30,404	.80
22	Street-lighting fixtures and parts	7,860.84	27,193.38	35,054.22	.70	841.26	2.40	4,908.27	14.00	549.07	6.98	6,298.60	17.97	667	956	36.67	3,243	2.42
24	Safety switches	27,886.57	18,664.87	46,551.44	.94	1,760.12	3.78	5,069.97	10.89	1,908.00	46.84	8,738.09	18.77	1,841	3,225	14.43	7,190	3.88
25	Dry batteries	49,981.58	8,651.96	57,633.54	1.16	1,635.61	2.84	3,948.00	6.85	2,085.75	4.26	7,669.36	13.31	1,806	2,352	24.50	12,924	3.79
26	Miniature lamps	53,209.51	1,913.81	55,123.32	1.11	2,207.71	4.01	6,778.90	12.30	2,164.13	.07	11,150.74	20.23	2,522	5,190	10.62	11,577	4.60
27	Carbon lamps	8,008.48	4,942.90	12,951.38	.26	579.72	4.48	1,304.04	10.07	1,151.63	.38	3,035.39	23.44	762	1,018	12.72	8,127	.99
28	Pole-line hardware	48,290.84	44,659.71	92,950.55	1.87	2,983.28	3.21	11,231.50	12.08	6,535.59	3.53	20,750.37	22.32	2,499	4,805	19.34	66,691	.72
30	Wood cross-arms	27,754.76	25,018.00	52,772.76	1.06	1,010.32	1.91	4,843.32	9.18	5,190.97	18.70	11,044.61	20.93	707	1,294	40.78	24,162	1.15
31	Glass insulators	25,197.83	19,085.30	44,283.13	.89	1,021.52	2.31	4,372.15	9.87	2,471.28	9.81	7,864.95	17.76	839	1,256	35.26	19,166	1.31
32	Bare iron, steel wire and strand	12,827.77	4,858.71	17,686.48	.36	519.79	2.94	2,822.41	15.96	1,300.87	10.14	4,643.07	26.25	559	848	20.86	2,599	4.94
40	Specialties miscellaneous	32,369.42	6,433.77	38,803.19	.78	1,367.08	3.51	7,117.67	18.34	1,535.89	4.74	10,020.64	25.82	1,465	2,051	18.92	3,817	8.48
41	Washing machines and parts	237,556.47	15,704.60	253,261.07	5.09	5,118.32	2.02	33,451.31	13.21	9,152.25	3.85	47,721.88	18.84	4,608	5,792	43.73	9,285	25.58
42	Ironing machines and parts	38,138.51	9,545.83	47,684.34	.96	846.56	1.78	20,622.32	43.25	3,922.85	10.20	25,391.73	53.25	559	629	75.81	505	75.52
43	Vacuum cleaners and parts	105,706.02	2,056.99	107,763.01	2.17	2,280.78	2.12	15,043.24	13.96	3,102.65	2.94	20,426.67	18.96	1,900	2,514	42.87	5,902	17.91
44	Electric ranges and ovens	58,877.95	32,313.36	91,191.31	1.83	2,101.63	2.30	14,434.31	15.83	4,497.67	7.64	21,033.61	23.07	1,751	2,367	38.53	2,420	24.33
45	Heating devices	143,818.28	23,649.65	167,467.93	3.37	8,760.39	5.23	23,819.95	14.22	10,879.70	7.56	43,460.04	25.95	10,337	15,769	10.62	43,386	3.31
99	Miscellaneous	70,406.90	79,670.14	150,077.04	3.02	7,716.95	5.14	11,492.50	7.66	8,070.16	11.46	27,279.61	18.18	8,135	15,951	9.41	50,464	1.40
	Automobile accessories	304,912.18	35,205.68	340,117.86	6.84	8,378.61	2.46	49,800.13	14.64	13,849.92	4.54	72,028.66	21.18	8,167	15,141	22.46	19,685	15.49
	Lighting fixtures	347,139.61	32,358.93	379,498.54	7.63	14,845.74	3.90	69,048.31	18.19	37,877.03	10.91	121,771.08	32.09	13,046	24,088	15.75	44,659	7.77
	Apparatus sales	164,601.94	173,837.92	338,439.86	6.80	6,794.06	2.01	29,836.58	8.82	14,747.25	8.96	51,377.89	15.18	4,276	6,975	48.52	11,293	14.58
	Sundry commodities	137,180.72	138,782.59	275,963.31	5.54	6,864.62	2.49	38,575.80	13.98	9,858.42	7.19	55,298.84	20.04	5,757	12,261	22.51	39,092	3.51
	Total	$3,722,438.72	$1,252,647.45	$4,975,086.17	100.00	$153,553.99	3.09	$537,222.01	10.80	$248,761.62	6.68	$939,537.2	18.88	144,487	283,931	$17.52	1,025,103	$3.63

*Compiled by the sub-committee of the committee on accounting and statistics of the Electrical Supply Jobbers' Association, 411 South Clinton Street, Chicago.

†This amount includes $4,793.82 outgoing transportation, which generally is not considered operating expense, but should be added to these expenses to obtain total cost of handling this commodity.

per cent to handle, which is more than it is worth. And metal molding and fittings, totaling 0.23 per cent of the sales, cost in all 34.74 per cent to handle. "Other conduit fillings" cost 41.55 per cent to handle. Fuses cost 24.62 per cent and 22.96 per cent to handle. Lighting fixtures cost 32.09 per cent to handle and ironing machines and parts 53.25 per cent, with washing machines and parts at 18.84.

SPENDS ONE-HALF OF WHAT HE RECEIVES

As a result, when any one of these five jobbers sells an ironing machine—and it is substantially the same with other jobbers—he is spending one-half what he gets in operating costs without a living chance to make a cent. On a five-million-dollar business here, 144,487 bills and credit memos were made out, there were 288,931 separate items on the bills, 1,025,103 separate units of material had to be gathered and shipped, and the average selling price of all these units shipped and called for was $3.63! The average operating expense on the entire business figures 18.88 per cent of the selling price.

It is a good thing to know the facts even when they hurt, and these facts certainly are of that kind. They present a problem of vital import not alone to the jobber but to the manufacturer and to the contractor, dealer and central station. These goods must be distributed, but palpably they cannot very much longer be distributed by these methods and on existing policies if the jobber cannot make money doing it this way.

Italy Confronted by Great Power Shortage from Lack of Snow

THE industrial zone in northern Italy is threatened with an unprecedented power shortage. The shortage will reach its peak on April 1, but, reports to the Department of Commerce say, it has been serious since early in December. An abnormally small snowfall in the northern mountains last winter and the intense cold which prevailed throughout the summer in the upper mountain levels, hindering the snow from melting, have caused the streams which are relied on for power to fall to very low levels.

In an effort to develop new sources of water power it has been proposed to tap the southern end of Lake Lecce. At that point, it is estimated, 2,000,000 kw. could be developed without lowering the level of the lake to the point where hardship would ensue. Work already is under way looking to the emptying of Lake Castel into the Val di Toce. This development is expected to produce 5,000,000 kw. An estimate also has been made showing that 500,000 kw. could be developed by drawing off water from Lake Varese without lowering the level of the water more than 50 cm. It is believed that an additional 2,000,000 kw. could be obtained if Lakes Monate and Comabbio were connected with Lakes Maggiore and Amone by means of siphons across intervening hills.

The power shortage has become so serious that curtailments already have been made of the supply for less essential uses and it may become necessary to suspend all electro-siderurgical operations—highly developed in Italy—and supplant electric traction with steam locomotives on the Milan-Varese railway. Restriction of the use of electric lighting in homes to two hours daily is under consideration. One industial plant has rigged up a battery of farm tractors to furnish power for some of its generators.

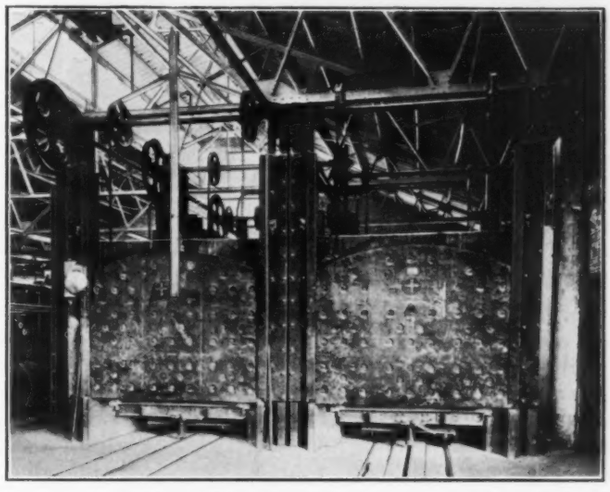
It is reported that beginning Feb. 1, 200,000 kw.-hr. of electrical energy was daily being diverted to northern Italy from Switzerland, in order to overcome to some extent the crisis arising from the electric power shortage. In view of the fact that Switzerland also is suffering from low water this action merely indicates to what extent the shortage in Italy has affected her economic status.

17.4 Lb. of Steel Annealed per Kilowatt-Hour

Several Thousand Tons Turned Out Without Single Rejection or Overheating—Inherent Troubles with Fuel-Fired Ovens Have Been Overcome

BY ALAN S. DAUCH
Engineer George J. Hagan Company

SEVERAL thousand tons of annealed steel wire have been turned out of the electric furnace used by the Fowler & Union Horse Nail Company, Buffalo, N. Y., during the past year and a quarter without a single rejection or overheating and with as low an energy consumption as 115 kw.-hr. per ton. All of the inherent troubles of the fuel-fired equipment replaced by the electric furnace have been overcome and the latter is relied upon exclusively. No fuel-fired equipment is held in reserve.



PREHEATING CHAMBER IS ALONGSIDE COOLING CHAMBER WITH FULL SIDE OPENING BETWEEN TO ALLOW INTERCHANGE OF HEAT

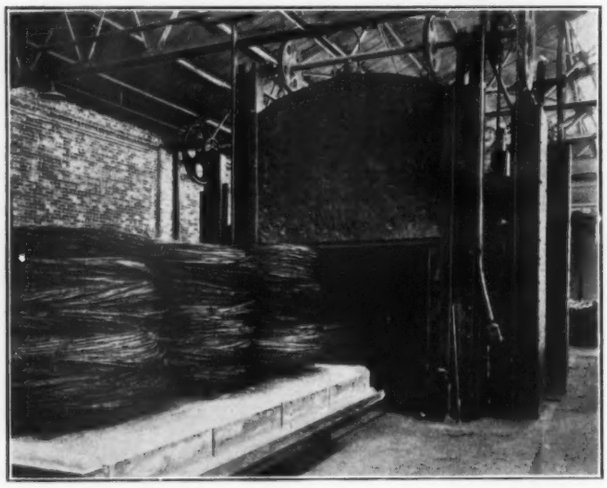
The product which is being annealed consists of ⅜-in. (9.5-mm.) steel wire from which horseshoe nails are made. The wire is delivered to the furnace on cars in coils weighing approximately 250 lb. (113 kg.), the charge per car being approximately 7,500 lb. (3,400 kg.). The cars are loaded and unloaded by an electric hoist.

The charge remains in each of the three chambers composing the regenerative furnace for a period of three hours. The heating chamber is maintained at a temperature of 1,360 deg. Fahr. (773 deg. C.). The complete cycle of operation is as follows: A cold charge is first placed in the preheating chamber, where it absorbs heat from the cooling charge. After a three-hour period this charge is taken out of the preheating chamber and

placed in the heating chamber, where it remains another three hours. At the end of this time the charge is carried into the cooling chamber, where it radiates heat to a new cold charge in the preheating chamber. The furnace thus delivers one 7,500-lb. (3,400-kg.) charge of annealed wire every three hours.

The labor cost attendant upon this large installation is surprisingly low. This cost is represented by the time of two men for a seven-minute period to operate the mechanical equipment for moving the cars and furnace doors and also to load and unload the cars. This operation occurs once every three hours.

When operating ten hours per day the furnace turns out a ton of annealed product with a power consumption of 185 kw.-hr. When operating on a continuous twenty-four-hour production a decidedly lower energy consumption per ton is effected, the results obtained from heats on a twenty-four-hour cycle not exceeding 115 kw.-hr. per ton of wire annealed. Converted to a fuel basis on the assumption that one kilowatt-hour can be generated from two pounds (0.9 kg.) of coal, the energy consumption is equivalent to 230 lb. (104 kg.) of coal. A well-designed and efficiently operated coal-fired annealing furnace would consume from 225 to 250 lb. (102 kg. to 113 kg.) of coal for annealing a ton of wire under similar conditions. It is, therefore, apparent that the fuel costs of the two types of annealing equipment would be virtually the same. There is, however, a decided advantage in favor of the electrical equipment from the standpoint of labor for operation, floor space, maintenance and quality of product.



CARLOAD OF COILS IN FRONT OF HEATING CHAMBER

The wire annealed in this furnace has proved to be superior in quality to that previously obtained from the fuel-fired equipments. Besides, the oxidation is less than in the case of the fuel furnaces. The annealed wire receives from twelve to fifteen cold-working operations without any further heating. Owing to the uniformity of the anneal obtained in the electric furnace, the upkeep cost on roll and die equipment has been materially reduced. In a large measure the die settings for the various cold-working operations have been standardized so that it is not necessary to change adjustments to meet variations in the temperature of the wire. With the electric furnace it is assured that all the coils in a charge are annealed uniformly, whether they are taken from the bottom of the charge or from the top. With the previous combustion equipment it was frequently necessary to remove the charge before the bottom coils were fully annealed in order that the coils at the top should not be overheated. This necessitated that the bottom coils be again introduced into the furnace for reheating, a procedure which was very unsatisfactory both from the standpoint of direct monetary loss and from the standpoint of plant operation.

The outstanding feature of the installation is its absolute dependability with respect to continuity of production and quality of product. This, in conjunction with the economy of operation and absolute freedom from adjustments and repairs, has conclusively demonstrated that the electric furnace is both commercial and practical and possesses merit of a high order for industrial heating processes on a large scale.

The electric annealing equipment, which is of the regenerative-car type, consists essentially of three furnace chambers, each 12 ft. (3.6 m.) long, 7 ft. (2.1 m.) wide and 4 ft. (1.2 m.) high. One of the chambers is employed for heating, one for cooling and one for preheating. The heating chamber and cooling chamber are set in tandem with a common door between, while the preheating chamber is placed alongside the cooling chamber with a full side opening between them to allow of a free interchange of heat from the hot to the cold charge.

The electric heating units, which are installed in the heating chamber only, consist of heavy nickel-chromium ribbon suspended on the side walls by means of special refractory insulators. There is a total heating capacity of 180 kw., the elements being designed for direct connection to the 440-volt, three-phase power service of the plant.

The automatic temperature-control equipment consists of a standard General Electric heater panel which is actuated by means of a Leeds & Northrup two-point control instrument. This instrument has a temperature scale from 200 deg. to 2,000 deg. Fahr., recording both the temperature of the heating unit and the charge and functioning as a controller as well. Neither the temperature of the ribbon nor that of the charge can exceed a predetermined value.

The furnace cars, which are 12 ft. long (3.6 m.), 6 ft. (1.8 m.) wide and 30 in. (0.75 m.) high, are of the swivel truck type and are heavily insulated. On both sides and ends of each car are sandseal troughs so that the furnace can be sealed when in service. The cars are moved into and out of the furnace by means of a special conveyor mechanism which was designed by the engineers of the Fowler & Union Horse Nail Company. The conveyor proper consists of two massive endless chains which are installed parallel to each other, entirely below the floor level, one being placed beneath the car track through the heating and cooling chambers and the other beneath the car track through the preheating chamber. The conveyor chain is provided with steel dogs spaced at car length intervals, which engage lock-bar pins on the furnace cars. Lock bars are provided at both ends of the cars so that either end may be engaged as required. The conveyor drive is at the extreme end of the furnace room. The control levers for the conveyor as well as the air valves for operating the five furnace doors are all installed on a control pulpit. From this point the operator can raise or lower any or all of the furnace doors and move the cars in or out at will.

This furnace was designed and installed by the George J. Hagan Company.

Economics of the Public Utility Business

The Capital Requirement—The Cost of Money—Conditions that Save Money—Some Mass Economies—Where the Money Comes From—Selling Junior Securities to Customers

By SAMUEL INSULL
President Commonwealth Edison Company, Chicago

IT IS difficult for any utility man to view his own business both close up and in panorama and to carry a clear vision not only of the details of his individual local enterprise but also of the great industry of which it is a part. Particularly is this the fact when it comes to the economic aspects in which interdependent relationships are so complex and manifold. Yet a true picture of the whole is essential to balanced thinking by the central-station executives. Mr. Insull, in a recent address before the Chicago Chapter of the American Institute of Banking, sketched this graphic presentation of the economics of the utility business. In spite of unavoidable condensation it gives a well-rounded conception of the active elements involved that should be organized into the mental background of every man who seriously makes the public service his study and his work. There is encouragement and inspiration in this record of progress and achievement.

THE economics of public utility business might be expressed in just one word — interest. At least 50 per cent of the expenses of operating local public utilities is the interest on the investment in the business. It is a business that turns its capital very slowly indeed. On an average, the local public utilities in a state having as great a density of population as the State of Illinois can turn their capital only about once in five years. That is to say, for every new dollar's worth of business we require on an average five dollars of new capital.

It takes, on an average, about 50 per cent of the gross revenue to pay operating expenses, depreciation and reserve—a little over 50 per cent perhaps, probably nearer 55 per cent—and consequently it leaves about 45 per cent for interest on securities, dividends to stockholders and the necessary reserves in the shape of surplus or other reserves to provide for a rainy day. In a business having such a heavy interest charge, and having such an amount at, say, 6 per cent interest, to be earned before any profits can be said to have been obtained, credit cannot be maintained unless proper rates are maintained, and that is the great fundamental requirement of such a business.

It is perfectly natural that during a period such as we have gone through, dating really from 1914 up to the last six months, such institutions should suffer during the general uprise in prices of all commodities and labor. It was a physical impossibility for a utility commission to meet the situation and deal with it as promptly as the increase in costs became evident. Such bodies have been used for a period of years for regulating our prices downward. During the period prior to the great war the tendency of our costs had been downward for a variety of reasons, and for the commissions to switch around and do justice to the utility when for some years previous their main job had been to do justice to the customers of the utility was a pretty severe wrench on them and also on the public mind. But, looking at it from the experience of the last few years, I think those various regulatory bodies rose to the occasion in a remarkable way and rendered great service not only to the investors but to the customers of the utilities by regulating prices upward and so preserving the credit and earning capacity of practically all of the utilities that come before them with a proper case.

Fortunately for us, the peak of money cost has passed, the peak of labor cost has passed, the peak of material cost has passed, and the peak of investment cost has passed; but even while these various things were at their very highest and while we were paying the highest possible prices for money, the damage that was being done to us and to the investment of our owners was far less than it seemed to be at the time we had to pay such high prices for money.

Take, for instance, the case of the Commonwealth Edison Company. This company paid during the war as high as 9 per cent for money, practically 60 per cent higher than it had been in the habit of paying. The total money put into the business from senior securities up to the start of the war had cost 5.23 per cent. Similar securities sold during the war cost 6.68 per cent. Some of those securities, as I stated, were sold at such a high price as to cost the company a little more than 9 per cent; and yet if you take the entire effect of war financing and average the cost of the money put into the business both prior to the war and during the war—that is, from senior securities—the total increase in cost was only 0.79 per cent, an amount that is simply negligible.

War Time Money Cost Was No Test of Stability

If a great institution like the Commonwealth Edison Company, that is able to pay its stockholders a fair dividend, 8 per cent, could not stand as a result of the greatest cataclysm the world has ever seen an increase of a little over three-quarters of 1 per cent in the cost of its money, it could not be considered a very stable business.

The effect of war-time financing on the Public Service Company of Northern Illinois, when you average the cost of the money prior to the war and during the war, only showed an increase of 0.83 per cent. The permanent increase in the cost of money obtained from senior securities in the Middle West Utilities Company is less than with the Public Service Company, or only 0.81 per cent.

I mention these figures to show what a negligible quantity is involved in the war financing of the local public utility business, and I do not think those figures would vary very much in any part of the country in

institutions of similar development and similar credit engaged in the public utility business. I think they are a pretty fair example. I think the Commonwealth Edison Company's figures would compare with those of New York, Philadelphia and Boston. I think the Public Service Company's figures would compare with any of the suburban properties surrounding any of those cities. I think the Middle West Utilities Company's figures would compare with any reasonably well-operated and conservatively capitalized holding company run by persons who understood the business.

CONDITIONS THAT SAVE MONEY

As a matter of fact, while the cost of money has increased on the face of it, the figures we have been able to work out with relation to the operation of our various properties indicate that the cost of money has really gone down materially. The governing question in connection with public utility economics and public utility finances is the investment per unit of maximum demand. For instance, if that investment is $500 and money averages, we will say, 6 per cent, why that is $30 a year. If that investment is $250 and money happened to average 8 per cent, why that interest charge would be $20 a year, and that is exactly what is going on in local public utility business.

There have been a number of reasons for that reduction in the investment per unit of maximum demand. When I first went into the local public utility business here in Chicago the investment was only used about 20 per cent of the time. That is, we had a load factor of 20 per cent. The average use of our investment, expressed in a proportion to the maximum use of our investment—that is, the average use twenty-four hours a day 365 days a year—was only 20 per cent of the time when figured against our maximum demand. That situation changed from year to year so that at this time our investment is used about 45 per cent of the time. That is, the relation of the average use to maximum use figures out a 45 per cent average use. So that our capital average used to be idle about 55 per cent of the time, and it is in an effort to change that condition that we are able to affect the cost of money and other overhead permanent costs that are dependent upon the total capital invested and not dependent upon the average use of that capital.

LESS RESERVE FOUND POSSIBLE

There are a great many things that go to help us in doing that. For instance, our losses, that is the unaccounted-for energy that we manufacture at this plant, is around 10 per cent, perhaps a little more than that. Twenty-five years ago it was 30 per cent. Then, owing to the difficulties in obtaining apparatus or men to install that apparatus during the war, owing to shortness of labor and manufacturing establishments being used for war purposes instead of for purposes of peace, we were compelled to run our plants with less reserve than we did prior to the war. Prior to the war we carried about 33⅓ per cent reserve. During the war we ran at from 15 to 18 per cent reserve. In other words, we put 15 per cent more of our capital into actual use. Necessity compelled us to do so, and in doing so we learned that it was perfectly safe to run our business on less reserve.

Moreover, there have been a great many other things that have tended to bring more of our capital into use. A great deal of our work takes far less money, because the investment on customer's premises is much less than half of what it was twelve or fifteen years ago. That is partly owing to improvements in devices and partly owing to the fact that our customers use more energy on their premises for the dollar invested in putting them in a position to take that energy. Another thing that has helped us is the building up of proper depreciation accounts and reserve accounts that have been reinvested in plant and distribution systems. Those have tended to arrest the increased cost of money, because, fortunately, any money obtained in that way and put into plant does not have to pay the banker interest.

There is some advantage in being in a business whose fixed capital is put into permanent plant and whose merchandise on hand, subject to rapid variation in value, and whose receivables together form a negligible quantity, so far as total investment is concerned. One of the reasons why the banking interests have had little or no trouble with utility investments is the fact that if their entire accounts receivable and merchandise on hand disappeared, it would not affect their capital investment 15 per cent. That is one of the fundamental reasons of lack of trouble with them.

EACH DOLLAR USED MANY TIMES

There are other factors that go to increase the economies. Take the ordinary operations of the human being. Let us assume he is on the top floor of one of our office buildings. He burns light over his desk. He cannot do that and go down in the elevator at the same time, and he cannot go down in the elevator at the same time that he is riding on the street car; and he cannot ride on the street car at the same time that he is cooking his dinner by electricity in his kitchen in his flat. And yet all those operations use energy and they use it at different times. So that the dollar invested serves its purpose again and again and again, and you have concentration of investment and diversity of use.

When I first went into the business of electricity all we did was to use the electricity for light, and as a result our investment was only used about 20 per cent of the time, as I have stated. Today it is used for all those different purposes, and in this city we use it, as I said, 45 per cent of the time. If you will go further west, where instead of depending upon the black fuel of Illinois they depend upon the white fuel of the waterfalls of the Sierra Nevadas, you will find in Montana, or if you go further west along the slope of the Pacific, that energy is used for so many different purposes because it can be bought so much cheaper that the load factor is 60 or 70 per cent, or 50 to 60 per cent more use of the investment than we are able to get in this particular location.

BALANCING INDUSTRIES

We produce 70 per cent of the ice that is used in the city of Chicago by supplying the electric energy to run artificial ice plants. Flats and residences use electricity in the winter in a community like Chicago; they use very little indeed in the summer. The use of electrical energy by ice manufacturers is negligible in the winter. So the investment that supplies the householder with light and heat in the winter supplies him through his ice man with refrigeration in the summer. We get a double use of the investment. That has affected us to such an extent that whereas 80 per cent of our energy used to be put out in the winter and only 20 per cent in the summer, at this time 47 per cent of our energy is

supplied to our customers during the summer months and only 53 per cent of our energy is supplied to our customers in the six winter months. We are getting closer and closer to a point where, owing to the great diversity of demand, the chances are that our investment, less that which we hold for reserve, will be employed all the time.

SOME MASS ECONOMIES

Some day all of the steam railroads wherever there is density of population are going to be electrified. There may be a relatively small amount of territory where that will not be possible. When that is done there will be a saving of around 250,000,000 tons of coal a year, the difference between producing power under the uneconomical conditions governing a steam engine on a railroad track and its production in very large volume with a highly economical steam plant. The central electric stations of the United States produce 42 per cent of the energy used in the United States for all forms of power, including manufacturing and the railroads, and only consume 12 per cent of the coal used for these purposes. The steam railroads use 160,000,000 tons of coal per year at this time and the manufacturing plants use 145,000,000 tons of coal per year, while the central stations use only 40,500,000 tons of coal per year but turn out one-third more energy in the form of horsepower than is used by either one of these other two great industries. The central stations require an average of only 1½ lb. of coal per horsepower-hour, while 7 lb. or 8 lb. per horsepower-hour is required for the steam railroads and the manufacturing plants. That expresses in a few words the real economics of the electric light and power business.

WHERE THE MONEY COMES FROM

Now comes the question, "If you do $130,000,000 of business a year, and you get 8 per cent or 10 per cent increase a year, and it takes five dollars of new capital for every dollar of new gross business to enable you to function, how do you raise the money?"

The war has taught us one very important thing. A man who has to raise a million dollars a week has found it very hard during the war-time period. So he has had to go to a new source to raise money. We have had to go to the customers of our properties to take our junior securities, and it was the very best thing that ever happened to us. We have increased the stockholders of the Commonwealth Edison Company from 5,000 or 6,000 on Armistice Day to 25,000 or 26,000 at the present time.

Of the $40,000,000 or $50,000,000 new money that is needed by the group of properties that I am operating around Chicago and in fourteen other states, we expect to get somewhere between 40 per cent and 50 per cent of the money required from our own customers each year. Last year we sold $18,000,000 worth of preferred and common stock to them. This year we are selling at the rate of $25,000,000 of preferred and common stock to them. In a recent issue of increased stock to the stockholders of the Commonwealth Edison Company we had to have a corps of more than 100 persons to explain to the small stockholder what his rights were and how he should go about taking advantage of those rights, as there was a certain profit in his preserving his rights. And while it introduces some problems in corporate management, it introduces absolute security and an absolute permanency of our investment.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Engineering Enrollment in Harmony with Economic Conditions

To the Editors of the ELECTRICAL WORLD:

Any theories advanced to account for the decrease shown by the survey of the ELECTRICAL WORLD in the number of electrical engineering students must be purely speculative, for fluctuations during short periods, as between successive years, cannot prove anything or even definitely establish a trend. Whatever may be the reason for the fluctuations, a downward trend in engineering enrollment would seem to be in harmony with economic conditions.

Engineering employment, at least so far as concerns additional employment, depends largely upon industrial expansion, and there is little expectation of any further such expansion for some time to come. Increase in the output of most central stations for a year or so will not be due to the development of new or expanding industries and will not call for any material increase in their engineering forces.

Although I am an optimist, I believe that for a time at least the output of engineers is likely to exceed the demand. Consequently a temporary decline in the enrollment of engineering courses should not foreshadow any handicap to the future progress of the electrical industry.

HERBERT A. WAGNER,
President.

Consolidated Gas, Electric Light & Power Company,
Baltimore, Md.

Industrial-Plant Voltages in Pennsylvania

To the Editors of the ELECTRICAL WORLD:

The article on "Industrial Load in Pennsylvania" in the issue of the ELECTRICAL WORLD for Dec. 31, 1921, brings out the wide variety of voltages in use in the industrial plants of Pennsylvania. It cannot be said, however, that this lack of standardization is common to all public utilities of the Keystone State. In alternating circuits the Duquesne Light Company provides as standard the following: 110 volts, single-phase; 110-220 volts, single-phase, three-wire; 220 volts, three-phase; 440 volts, three-phase; 2,300 volts, three-phase; 11,000 volts, three-phase, and 22,000 volts, three-phase—all 60-cycle.

We have, however, on the circuit some customers who are using voltages different from these standards, as, for instance, electric furnaces employing from 80 volts to 100 volts, single-phase, two-phase and three-phase, the smallest one only using single-phase. These people, however, furnish or own electrical equipment and buy power from us on a standard voltage. In direct current we have a limited zone where 500 volts is furnished for elevator work.

It is absolutely necessary that the utilities standard-

ize on some fixed sales voltages. I know certain utilities which will furnish almost any voltage, phase or condition that any of their customers want. Possibly those who handle their business in that way know where they are going. We certainly do not.

Duquesne Light Company, Pittsburgh, Pa. C. S. COOK, General Manager.

Factors Affecting Electric Hoisting

To the Editors of the ELECTRICAL WORLD:

In the article entitled "Factors Affecting Installation of Electric Motors for Hoists," appearing in the Jan. 28 issue of the ELECTRICAL WORLD, I find two mistakes in formulas which you will probably desire to correct. In the second paragraph on page 171 is a formula reading Hp. $= WV/53{,}000e$. This should be Hp. $= WV/33{,}000e$. On page 172 the second long formula which covers the case when a skip is capsized should read

$$P = (L + C) \cos \theta + \frac{(L + C) \sin \theta \times 25}{2{,}000}$$

A plus sign has been omitted between the two elements.

Freyn, Brassert & Company, Chicago, Ill. GORDON FOX.

Jobbers Must Do Their Part in Co-operation with Manufacturers

To the Editors of the ELECTRICAL WORLD:

I have been strongly impressed by a letter on this topic in your issue of Feb. 18. The old-line jobber who actually buys goods for stock, keeps them moving, takes his cash discounts and covers his field thoroughly is the manufacturer's best friend and deserves the utmost co-operation. Few manufacturers can economically conduct their own distribution of goods, and the jobber came into the distribution system for good reason to do substantial service.

But co-operation is not co-operation if it is not mutual. If the manufacturer is really to accord full protection to his jobber, the latter must help by actually keeping an adequate stock and covering his territory completely. Moreover, he must not hesitate to keep headquarters informed of the extent of his distribution so that the latter may know, when an inquiry comes in, whether it is from a jobber's legitimate customer trying to sneak in at the back window, from a new concern which should at once be referred to the jobber, or from some one who, for reasons good or bad, does not want to do business with that particular distributing house.

It is the failure to keep the manufacturer thus informed that is the chief cause of many misunderstandings. For example, within the writer's knowledge the following sequence of events occurred: A manufacturer reached a distant state via two large and reliable jobbers who claimed between them to cover the territory. Somehow the distribution was not satisfactory, for inquiries came in from consumers very frequently. These were referred to the nearer jobber of the two with the request that the factory should be informed what dealers were actually carying goods in the vicinity concerned. Both jobbers replied that they did not know, despite the fact that any of their traveling men could have told them where he had been selling the article in question. After many months and repeated appeals the manufacturer was in no better position to know whether anybody in that state was buying the stock which he sold to the two big jobbers. The only person to whom he could direct inquirers with any certainty of finding the goods was an enterprising dealer with whom he had in despair established direct relations.

Quite at the Antipodes from these jobbers but just as undesirable is the jobber who never intends to buy and carry any real stock but writes the factory to ship "$\frac{1}{2}$ doz. P.X. 41144" to John Doe, Pogree Hollow, Del., "and charge the same to our account." It is quite needless to speak of the semi-jobber, the demi-semi-jobber and the blighter who buys on thiry days and, after four months and many reminders, sends a trade acceptance at ninety days, entirely useless as an asset unless full responsibility is accepted by indorsement.

The point is that jobber and manufacturer should get together, play with their cards on the table, and establish a firm and definite relationship, if the consumer is to have a fair show to get the goods he wants.

Boston, Mass. ARISTIDES.

The True Inwardness of Pacific Coast Engineering

To the Editors of the ELECTRICAL WORLD:

The first editorial in the March 4 issue of the ELECTRICAL WORLD says that "the engineer on the Pacific Coast, as we have often intimated, has the courage of his convictions and an inclination to do things first and inquire into their possibilities afterward."

I think this is not a proper statement. Before the decisions were made which led to the adoption of a 60-cycle, 60,000-volt grounded system in 1898 to 1900 more than a year's time was taken in study and tests. The decisions in the light of today are correct, but we did not make them until we had given the matter very long and careful study and had facts to support us. The recent decisions on insulators, shields, regulations, etc., are based on several years' constant study and tests, and not made on meager information as your editorial would indicate.

The main point is that when we have made a thorough study and made our decisions we have been backed up by the company officials. They do not ask, "Has any one else done this thing you propose to do?" but ask, "Are you sure you are right from an engineering and economic standpoint?" Furthermore, I think one of the main reasons for our advance in water power and electric transmission is that we have our minds on water power, whereas the Eastern engineer has his mind largely on steam power. In other words, necessity largely forces the Western engineer to do things that seem bold to Eastern men.

San Francisco, Cal. F. G. BAUM, Consulting Engineer.

Organization Chart that Correlates Work

To the Editors of the ELECTRICAL WORLD:

The Utah Power & Light Company is receiving inquiries regarding the article entitled "Organization Chart that Correlates Work" which appeared above my name in your Feb. 4 issue. I have also received a letter from that company, the closing paragraph reading as follows: "We are calling this matter to your attention since undoubtedly you will wish to have a correction appear in a later issue."

May I ask that you call attention to the fact that I am not connected with the Utah company, but with the one indicated below?

R. A. HAMMACK, Superintendent of Distribution.

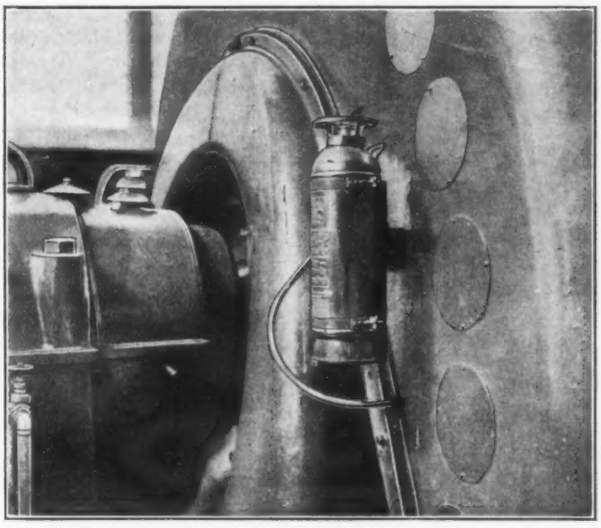
The Denver Gas & Electric Light Company, Denver, Col.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Liquid Extinguishers Effective for Quenching Generator Fires

THE use of liquid fire extinguishers permanently installed on generators has been found effective in quenching fires which originate in these generators on the system of the Pacific Gas & Electric Company of San Francisco. Four 3-gal. extinguishers are



PERMANENT TUBING IN GENERATOR HOUSING SPRAYS LIQUID ON BURNING COILS

mounted on each generator, as shown in the illustration, and arranged for easy connection to perforated tubing placed within the generator housing, where the liquid may be directed against the coil ends.

This tubing consists of four semi-circular copper pipes, two placed at each end of the machine inside the end casings with a T connection in the center of each to admit the liquid. Their ends are closed, the tubes being drilled with small holes directed radially toward the coils of the stator windings. The extinguishers are pivoted in place at the four corners of the generators. Normally these are in an upright position with the hose attached, but in case of fire the extinguishers may be inverted by rotating them on pivots and the hose can be attached to the copper tubes by means of a snap connector.

Prior to the general use of these extinguishers a failure occurred in the insulation of one of the generators on the system of the Pacific Gas & Electric Company, and although the generator was at once separated from the bus, the fields killed and the air dampers closed, the fire burned for more than one-half hour, although seven liquid fire extinguishers were emptied into it through the openings in the frame. The fires were not extinguished until the velocity of the rotor was decreased to the point where there was very little windage. The damage was found to be confined to the end of the coils, but more than 50 per cent of the complete set was ruined.

After equipping the generators with the fire-fighting system as described, another and similar fire occurred in another generator. One minute after the extinguishers were placed in operation no smoke was issuing from the generator and not one coil, except those adjacent to the arc, was damaged. It has been found that the liquid has no material deteriorating effect upon the insulation. FIELD EDITOR ELECTRICAL WORLD.

San Francisco, Cal.

Electric Oven Reduces the Cost of Vulcanizing Rubber

BY ADOPTING ovens for vulcanizing set-in rubber brushes the J. S. Costello Brush Company, St. Louis, Mo., has been able to eliminate the investment in steam equipment and the operating expense connected therewith. Although the usual method of heating in vulcanizing work has involved the use of steam, the company in undertaking the manufacture of set-in rubber brushes as a new department felt that this was unwarranted and determined to eliminate the trouble and expense attending the operation of a small steam plant.

Accordingly it secured a standard box-type electric oven which had a chamber 53 in. deep, 28 in. wide and 35 in. high. This was built with double doors, with 3 in. of sheet-insulating material on all sides, and so arranged, with rack rests placed every 3 in. on the inner wall, that as many as eleven racks or brushes may be handled at one time. Ten-kilowatt, 220-volt direct-current heating elements are placed at the bottom of the oven in a chamber 12 in. deep. Air is admitted to the oven through two openings below the door and is discharged at the top of the oven. Two Taylor automatic temperature controllers enable the oven to operate at two distinct temperatures.

In the manufacture of the brushes the hair is first immersed in a rubber compound which contains a high percentage of volatile liquid and then baked for about six hours at a temperature of 150 deg. Fahr. On the following day the rubber compound is baked or vulcanized for a period of six hours at a temperature varying between 275 deg. and 300 deg. Fahr. This variation of temperature is due to the fact that some of the materials handled require lower temperatures than others. It was found that precise temperature values and close temperature control was very essential in this work.

When this oven was first placed in operation it was discovered that the control apparatus permitted a temperature fluctuation as great as 30 deg.; consequently more precise instruments had to be installed. Also, the draft through the oven was too strong, owing to the fact that the oven discharge vent leads directly

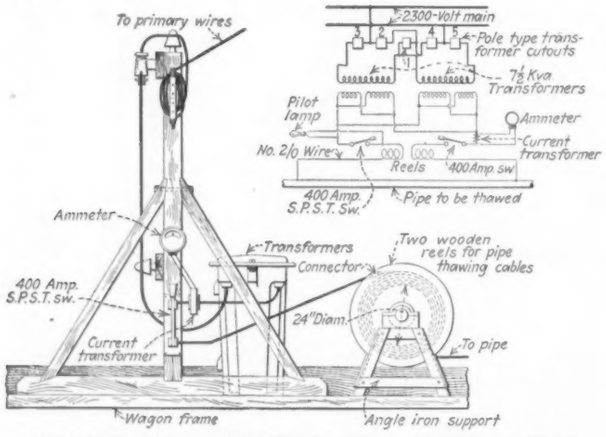
to the building chimney. Naturally, this draft prevented uniform distribution of heat, and brushes in certain sections of the oven were burned while others were incompletely baked. This trouble was eliminated when the stack opening was reduced and light metal baffles were placed on the racks. Better circulation was also obtained and the temperature variation was reduced to less than 10 per cent. Since an automatic control and alarm clock cut-off was installed, the oven requires very little attention and turns out satisfactory work.

JAMES W. CARPENTER,
Industrial Heating Engineer.
Union Electric Light & Power Company,
St. Louis, Mo.

Portable Pipe-Thawing Apparatus that Limits Current

BY WINDING the two secondary leads of an electric pipe-thawing outfit in opposite directions on reels having a common steel shaft it is possible to obtain an adjustable reactance for limiting the current employed. Portable apparatus involving this feature has been used very successfully by the electric department of the city of Calgary, Alberta, Canada.

The outfit consists essentially of a wooden frame for supporting the leads attached to the electric service circuit, two 7½-kw. transformers and two reels having a steel shaft. The details of construction are indicated by the accompanying illustration, which also shows the electrical connections. Five 2,300-volt pole-type cutouts are attached to the top arm of the frame. When plugs 2, 3, 4 and 5 are inserted, the primaries of the transformers are connected in parallel and 110 volts is impressed across the secondary terminals. If plugs 1, 3 and 5 are inserted, the transformers are connected in series and 55 volts is impressed across the secondary



OPPOSITELY WOUND SECONDARY LEADS ON REELS HAVING STEEL SHAFT LIMIT PIPE-THAWING CURRENT

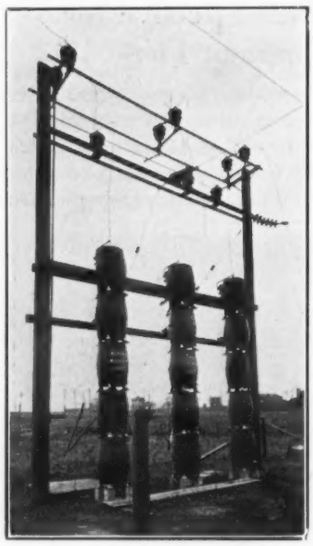
terminals. In the secondary circuit are a pilot lamp and an ammeter, the former indicating whether the circuit is closed and the latter guarding against overloading of the transformers. For a short job all the wire is unreeled, but for a long job seven or eight turns are left on the reels to limit the current.

The foregoing information was obtained from J. N. Lightbody, engineer of the electric light and power department of the city of Calgary.

FIELD EDITOR ELECTRICAL WORLD.
San Francisco, Cal.

Water-Barrel Lightning Arresters Give Satisfactory Service

WATER-BARREL lightning arresters installed on 60,000-volt circuits of the Ontario Power Company of Niagara Falls have been giving very satisfactory service, the one shown having been in use since May, 1914. A series of five barrels and disconnecting horn-gap set at 5 in. are used per leg. The barrels are kept filled with river water, and when the temperature drops to freezing in the fall they are removed and carborundum resistors inserted in their place. The electrodes are 3-ft. x 3-ft. x ⅛-in. copper approximately 23 in. apart. The bottom electrode is supported on a copper stud which protrudes through the bottom of the barrel and in turn supports the top electrodes of the barrel immediately under it. To prevent flashover at the surface of the water the stud is protected by a high-grade porcelain tube which rests on the top electrode. The barrels are insulated one from the other by pin-type porcelain insulators. Each barrel has a resistance of approximately 334 ohms at a temperature of 13.5 deg. C.



THESE LIGHTNING ARRESTERS PROVE SATISFACTORY ON 60,000-VOLT CIRCUIT

Water-barrel arresters are also in service on 12,000-volt and 30,000-volt lines, using two and three barrels respectively, with horn-gap settings of ⅜ in. and 2½ in. series with the barrels. Another horn gap is in parallel with the barrels, being set at ⅝ in. and 2¼ in. respectively for the voltages named. In the fall these barrels are removed, leaving the two horn gaps in series to ground, which gives very satisfactory protection for the winter months.

No investigations have been made to ascertain the extent to which these water-barrel arresters will drain steep-wave voltages from the line, but, speaking generally, their performance in this regard appears to be fully as satisfactory as the electrolytic arresters. This statement is based on the fact that equally satisfactory protection is being obtained on two parallel 60,000-volt lines, one equipped with water barrels and the other with electrolytic arresters. During line surges the discharge at the horns is approximately of the same nature as that at the horns of the electrolytic arresters, but possibly not quite so snappy. This would indicate more or less power current, but it is never of sufficient value to cause an interruption or make any great disturbance on the line. The discharge capacity of the water barrels is approximately 40 amp. at 64,000 volts, or about 2,500 kva.

While the barrels have flashed over occasionally, we have had very little trouble with them. According to the paper read by Dr. E. E. F. Creighton at the mid-winter convention of the American Institute of Electrical Engineers on "Deviations from Standard Practice

in Lightning Arresters," it would appear that we are operating *in spite* of the water-barrel arresters. However, regardless of figures, it must be kept in mind that the arrester shown has been in service for the past six years and during that time we have not lost a piece of apparatus in our plant that is connected to this line. The same thing is true of the 30,000-volt lines protected with water-barrel arresters.

H. M. KING,
Electrical Supervisor.

Ontario Power Company of Niagara Falls,
Niagara Falls, Ontario.

Operating Costs Cut by Running Boilers at Proper Ratings

MODERN furnaces and boilers are capable of being forced over peaks to a far greater extent than older equipment, and where the character of the load permits this means that substantial savings can be realized over banking. The most desirable rating at which to operate boilers depends upon the labor requirements, duration of peak, effect of forcing on fuel consumption and maintenance, amount of coal required for banking, etc. For a given plant the relations between forcing, banking and fuel consumption can be reduced to tables and graphs which are useful in establishing boiler-operating schedules for different conditions. An example of this method of analysis, as used by the Edison Electric Illuminating Company of Boston, was given in a paper by I. E. Moultrop and R. E. Dillon before a recent joint meeting of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers.

With modern equipment no appreciable increase in labor is necessary for operating at higher ratings. One

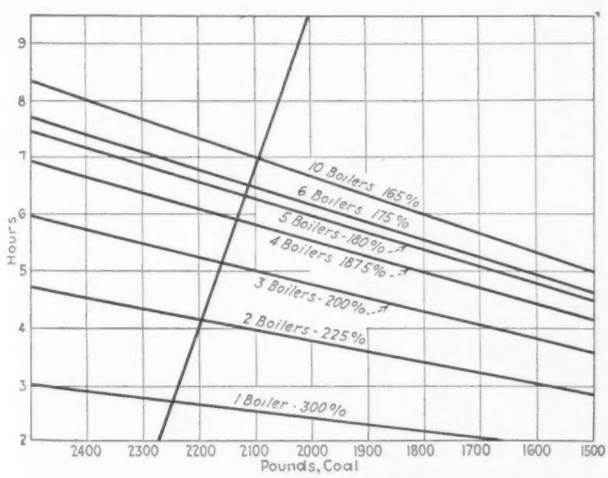


FIG. 1—BASIS FOR DETERMINING WHETHER TO BANK OR FORCE BOILERS

The steep diagonal, or banking line, indicates the amount of coal required to bank and bring one boiler up to steaming service when the duration of the peak is that indicated on left-hand scale (based on banking twenty-four hours minus duration of peak). The group of lines intersecting the banking line represent the coal loss when operating different numbers of boilers above their economical ratings for the periods shown on left-hand scale. Hence the intersections with the banking line indicate the conditions when there is an equal loss in fuel whether banking or forcing is employed.

fireman can handle a row of several boilers, and the running of additional units will not substantially increase his work. It is usually difficult, on the other hand, to operate at very low ratings without burning holes in the fire, and for this reason and other considerations it was found best in this installation to do some forcing on the dayload runs.

Whether boilers shall be forced over the peak or whether additional boilers shall be banked for it is a problem affected by the duration of the peak and the type of equipment available. Much depends on how long a given high rate of forcing can be maintained without the fires getting out of condition. Much higher rates can be employed for short periods than would be practical for longer times. The extent of high forcing and the period used affect the maintenance costs, which mount rapidly with high rates for protracted periods. There is a point at which the loss due to extra fuel burned by forcing equals the loss from carrying additional boilers banked for the peak. This point is shown in Fig. 1, the intersection of the steep diagonal line with less-inclined lines expressing the fuel losses resulting from forcing a given number of boilers at a given percentage rating over a stated period.

LOSS OF COAL CAUSED BY FORCING BOILERS ABOVE THEIR ECONOMICAL RATING

The figures at the right indicate the amount of coal which would be saved per hour if one more boiler were added to each group so all units could operate at 150 per cent of rating. For example, if ten boilers are operated at 165 per cent of rating to carry a certain load, 300 lb. more coal per hour is being burned than if eleven boilers were operated at 150 per cent rating.

No. of Boilers in Service	Rate of Forcing (Per Cent of Rating)	Extra Coal (Lb. Per Hr.)	No. of Boilers in Service	Rate of Forcing (Per Cent of Rating)	Extra Coal (Lb. Per Hr.)
1	300	835 x 1 = 835	5	180	67 x 5 = 335
2	225	265 x 2 = 530	6	175	55 x 6 = 330
3	200	140 x 3 = 420	10	165	30 x 10 = 300
4	187.5	90 x 4 = 360			

This chart indicating the effect of forcing boilers is developed from the table, which shows the losses in pounds of coal caused by forcing different combinations of boilers above their economical rating in order to carry for one hour the load that would be economical for this combination plus one more boiler. The data given are based on actual tests and the fact that 150 per cent rating has been determined to be the most efficient and practical rating at which to operate this set of boilers through the day. The amount of fuel required to force the boilers is determined from the efficiency curves of the units by dividing the product of the horsepower rating times 34.5 lb. of water times the latent heat of steam (aproximately 970 B.t.u. per pound) times the percentage rating by the product of the percentage efficiency of the boiler at the rating named into the calorific power of the fuel (about 14,300 B.t.u. in the cases presented). The difference in fuel consumption between two different ratings is the increased fuel required per hour to operate at the stated degree of forcing.

From the table it appears, for example, that if two boilers of the group studied are operated at 225 per cent rating, 530 lb. more coal per hour is required than if three similar units are run at 150 per cent rating. Tests show that it requires 1,500 lb. of coal to bring one of these boilers from banked to steaming service and 35 lb. of coal per hour to maintain the boiler banked. The steep diagonal in Fig. 1 shows the total amount of coal required in banking for a period of twenty-four hours minus the duration of the peak. Thus, assuming a four-hour peak for illustrative purposes, the banking period becomes twenty hours and the coal consumption is 20

times 35, or 700 lb., plus the 1,500 lb. required to bring to steaming service, or a total of 2,200 lb. The group of lines intersecting the banking line represents merely extensions of the coal loss data of the table for other periods than one hour, and curve *B* in Fig. 2 shows the points of intersection of Fig. 1 plotted against time. That is, these intersection points indicate the conditions when there is an equal loss in fuel whether banking for a given period is done or whether the particular boiler

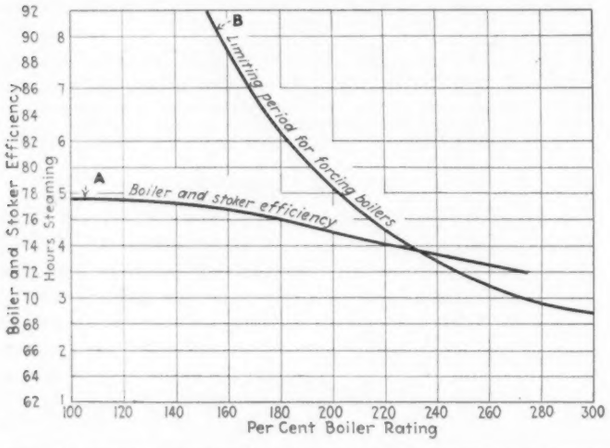


FIG. 2—TYPICAL EFFICIENCY CURVE AND ECONOMICAL FORCING LIMITS OF BOSTON COMPANY'S BOILERS

Curve B shows the intersections in Fig. 1 plotted against time.

group shown is forced for the stated period at the rating indicated. From Fig. 2, then, can be determined at a glance the limiting periods at which boilers can be forced without greater fuel losses than would be incurred by banking.

Schedules of boiler operation are prepared upon these diagrams as a basis, bearing in mind the duration of peak loads and the variations in the plant load curve. The curves herein shown enable those in charge of plant operation to determine the extent of banking and forcing likely to be required for any given duration and magnitude of peak. Schedule peaks and peaks that occur regularly are cared for by forcing boilers or by holding boilers in bank. Emergency peaks are frequently thrown upon the system with warning for only a few minutes' preparation. Thunderstorms can usually be discounted ten or twenty minutes ahead and hot banks prepared, the fire and air-pressure being built up in the steaming boilers. In such cases there need be no disturbance in absorbing the load, and this is generally accomplished with but a slight decrease in efficiency.

FIELD EDITOR ELECTRICAL WORLD.

New York, N. Y.

Geared Truck Permits the Moving of Heavy Transformers

WHEN overhauling or repair of an installed transformer becomes necessary it is customary to remove the machine to the repair shop of the plant. To facilitate this transfer large transformers are in all cases equipped with trucks and wheels. To avoid the use of a turntable, transfer trucks are employed along the row of transformers. The actual moving can be done either with some temporary fall-and-tackle arrangement or by means of crowbars inserted into notches provided for that purpose in the wheels.

Another very simple method for moving transformers has recently been used on all the transformers in the Ritom power house of the Gotthard tunnel road electrification in Switzerland, built by the Oerlikon works. The transformers are single-phase, 16⅔-cycle, with 12,000 kva. output, and weigh complete with oil about 60 metric tons. The middle of the high-voltage winding is grounded outside of the tank. The machines have four-wheel trucks, and on the truck shafts are fastened large gear wheels which small gear pinions engage. At the two ends of each pinion shaft are attached levers about 5 ft. long with a ratchet head working either way. It is claimed that four men working at the four levers can easily move the entire transformer.

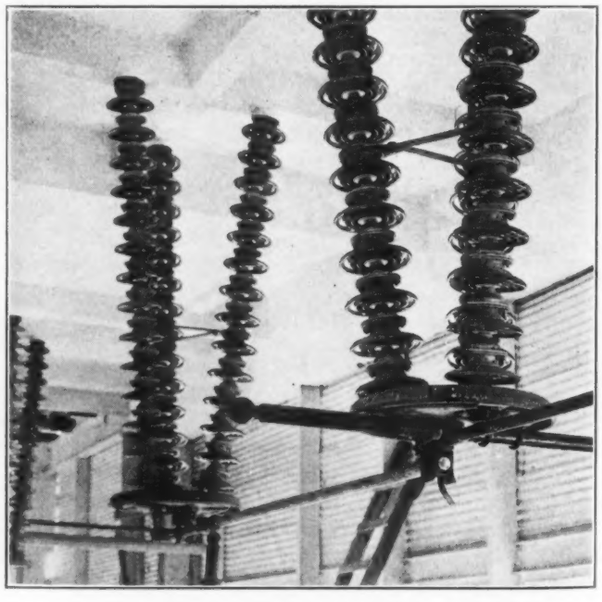
Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Replaceable Units Used in 220,000-Volt Bus Construction

PILLAR-TYPE insulators composed of fourteen interchangeable units each have been used by the Southern California Edison Company in the construction of its Big Creek No. 8 station, which was recently completed for ultimate operation at 220,000 volts.

The units of the insulators are made up in the company's shop and consist of standard 10-in. porcelain suspension units having malleable iron fittings cemented to them. The fittings, which are hot-galvanized, are composed of a pin or cap on one end and a flanged union connection on the other. The flanged connections are cast male and female and have four holes for bolting them together.

Struts are placed between the mid-points of the



INTERCHANGEABLE UNITS FOR BUS CONSTRUCTION

insulators to increase the rigidity of the pillars, which are arranged as tripods. At the busbar end of the pillars static shields are placed which reduce the unit voltage duty of the lower units to a point where cascading and subsequent flash-overs are suppressed. The shields consist of annular rings of cast aluminum.

FIELD EDITOR ELECTRICAL WORLD.

San Francisco, Cal.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

A Broad Study of Home Ownership

The Bureau of Housing Makes an Interesting Report on Conditions Existing in Many Cities — Some Pertinent Deductions for the Electrical Industry

THE Bureau of Housing recently established in the United States Department of Commerce in Washington has been doing some extensive research work in the field of home ownership, in the effort to develop information not only as to the condition of home ownership but as to the trend under modern conditions in urban life. The accompanying chart and table provide material for considerable study and develop some reflections which are a bit surprising.

In the city of New York, the chart shows, the lowest percentage of home ownership prevails shown by any of the listed cities, which embrace the forty-five principal ones. About 12 per cent of the occupants of New York own their own homes. The others obviously are apartment dwellers and occupants of boarding establishments and hotel suites. Des Moines shows the largest percentage of home ownership, with more than 50 per cent of the people owning their own dwellings. It is remarkable, however, that the extent of home ownership does not seem to follow any definite trend based either on the size of the community or on its geographical location. Whereas New York shows the lowest percentage, the neighboring cities of Buffalo and Philadelphia are well down on the list with a percentage of about 40. Rochester, Baltimore and Reading show an even greater proportion of homes owned by the occupants. San Francisco groups with New Haven, Paterson, Worcester and Springfield. Birmingham lists between Springfield and Pittsburgh. Reading has a place between Seattle and Kansas City.

The table, showing the trend in home ownership in the different cities between the years 1900 and 1920, also presents some very interesting phases of this situation. Conditions in New York are practically stationary, while in Philadelphia within the last twenty years there has been an increase from 22.1 to 31.9 per cent. In other words, home ownership in the city of Philadelphia has almost doubled. In Cambridge, Mass., however, home ownership has fallen off somewhat, owing to the increase in the construction of apartment houses. Boston has also decreased slightly. Jersey City has fallen off, as have New Orleans and Richmond. Los Angeles has decreased in home ownership by 10 per cent and Akron by 9 per cent. There are other similar cases. But, by and large, there is an almost universal trend toward a greater proportion of home ownership in spite of the general belief that we are becoming a nation of cliff dwellers congregated in large urban centers.

SHADED PORTION SHOWS PERCENTAGE OF HOMES OWNED

This analysis of present conditions should be distinctly encouraging to the electric industry. The war has been an element of influence, undoubtedly, because profiteering by landlords during the war period increased to a degree the purchase of homes by families that formerly had rented. Across the country, however, there is a clear indication of a healthy progressive increase, with which must develop a greater interest in household equipment and property improve-

HOME OWNERSHIP COMPARISONS FROM BUREAU OF CENSUS STATISTICS, CITIES OVER 100,000

City	Total Homes 1920	Per Cent Owned 1920	1910	1900
New York	1,278,341	12.7	11.7	12.1
Cambridge	25,293	17.6	18.9	21.2
Boston	164,785	18.5	17.1	18.9
Fall River	26,399	19.7	17.8	18.0
Jersey City	67,288	19.7	20.2	20.0
Newark	93,274	20.2	20.0	21.1
Hartford	30,813	20.8	21.5	21.8
New Orleans	85,188	23.1	23.1	22.2
Norfolk, Va	26,732	23.2	20.3	17.0
Providence	54,726	23.5	20.8	21.0
Yonkers	22,126	23.5	23.5	23.4
St Louis	190,640	23.8	25.0	22.8
Bridgeport	31,994	24.6	22.1	23.1
Atlanta	49,523	24.7	24.7	18.6
Richmond	39,191	25.9	24.0	22.3
Lowell	25,034	26.1	22.4	22.9
Chicago	623,912	27.0	26.2	25.1
New Haven	36,257	27.0	25.5	26.6
Paterson	32,186	27.4	24.0	23.2
San Francisco	123,349	27.4	33.0	24.1
Worcester	39,230	27.7	24.4	24.9
Springfield, Mass	30,361	27.9	29.4	33.3
Birmingham	43,040	28.1	29.7	13.8
Pittsburgh	130,274	28.3	28.0	26.7
New Bedford	26,858	28.6	25.3	27.9
Albany	28,097	28.7	26.9	26.3
Cincinnati	106,239	28.7	23.2	20.9
Memphis	42,369	28.9	25.2	18.8
Louisville	60,490	29.8	26.6	26.4
Washington, D. C.	96,194	30.3	25.2	24.2
Nashville	30,220	31.9	30.6	26.0
Houston, Tex	33,932	34.2	31.4	31.7
Indianapolis	81,256	34.5	33.0	33.7
Kansas City, Mo	82,056	34.7	36.2	24.2
Los Angeles	159,476	34.7	44.7	44.1
Cleveland	182,692	35.1	35.2	37.4
Milwaukee	106,101	35.5	36.4	35.9
Scranton	29,768	35.5	37.6	37.9
Columbus, Ohio	58,913	36.6	35.7	31.2
Dallas	36,754	36.9	36.0	33.2
San Antonio	36,405	37.8	40.8	38.0
Syracuse	41,558	37.9	39.7	37.4
Fort Worth	25,052	38.1	34.7	38.0
Trenton	25,319	38.1	31.2	26.2
Denver	61,916	38.3	36.2	28.0
Detroit	218,973	38.3	41.2	39.1
Wilmington	24,488	38.3	30.4	27.1
Buffalo	116,201	38.6	34.2	32.9
Philadelphia	402,946	39.5	26.6	22.1
Camden	26,645	40.5	29.2	25.7
Minneapolis	91,843	40.9	40.4	28.7
Dayton	38,138	41.9	38.1	38.0
Oakland	55,793	42.0	46.7	41.9
Rochester	68,247	42.5	42.1	37.8
Salt Lake	28,216	44.3	45.1	40.0
Portland, Ore	67,045	44.6	46.3	31.4
Spokane	27,178	44.6	51.3	37.2
Akron	44,195	44.7	50.4	53.7
St. Paul	54,409	46.1	41.2	29.9
Baltimore	166,857	46.3	33.7	27.9
Seattle	80,048	46.3	44.9	31.6
Reading	25,202	46.6	39.6	37.1
Kansas City, Kan	25,009	47.6	46.1	33.7
Youngstown	28,699	47.8	40.7	45.1
Omaha	44,499	48.4	39.8	27.7
Toledo	57,951	49.4	44.3	43.0
Grand Rapids	33,703	50.2	47.9	41.4
Des Moines	31,644	51.1	45.6	38.5

ment. This will react inevitably in an expanded market for electric service and the more extensive use of electrical appliances.

Repeat Orders for Preferred Stock from Customer Owners

POWER companies which sell their securities to customers for any length of time soon face the question: How often will an average customer buy preferred stock? Some interesting figures on this question have been compiled by the Central Maine Power Company, which has sold stock regularly for nearly fourteen years and intensively for the past four years.

This company finds that 24 per cent of its stockholders have bought stock twice or oftener. Here are the figures:

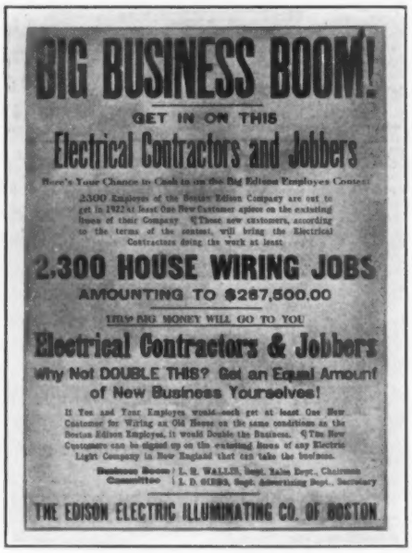
Stockholders who have bought twice	16 per cent
Stockholders who have bought three times	4.5 per cent
Stockholders who have bought four times	1.9 per cent
Stockholders who have bought five times	0.8 per cent
Stockholders who have bought over five times	0.9 per cent

Two stockholders have bought twelve times in four years.

Salesmen of this company plan to call on stockholders at least twice a year.

Extension of Boston Business Boom

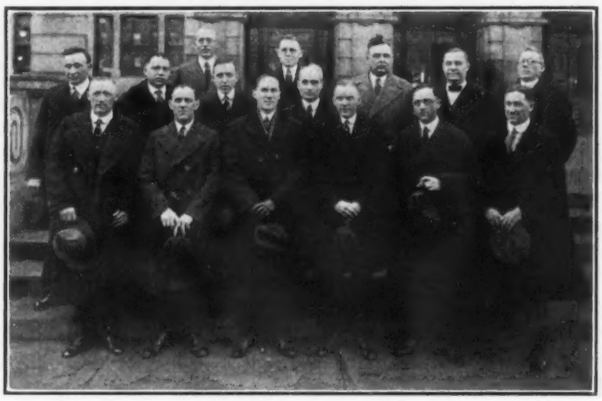
THE Edison Electric Illuminating Company of Boston is further extending its campaign for new customers by distributing the accompanying poster to New England jobbers and electrical contractors in its territory. Three thousand of these posters have already been mailed and the effect of the co-operative drive for the wiring of old houses is already being felt. Widespread interest among the employees of the company in the contest for new customers is rewarding those in charge of the campaign. At a recent department head conference it was agreed that the securing of a new customer must include the wiring of the house in which he lives and that house must be on the existing lines of the company, that is, within one span of wire from the company's service lines. As stated in the ELECTRICAL WORLD for March 4, ten special prizes will be awarded. In the contest those employees having ready access to the public, such as those in the sales department, application department and district manager's department, except clerks in these departments not in immediate contact with the public, are ineligible for prizes. Bureau and department heads are also ineligible.


BIG BUSINESS BOOM!
GET IN ON THIS
Electrical Contractors and Jobbers
2,300 HOUSE WIRING JOBS
AMOUNTING TO $267,500.00
THIS BIG MONEY WILL GO TO YOU
Electrical Contractors & Jobbers
Why Not DOUBLE THIS? Get an Equal Amount of New Business Yourselves!
THE EDISON ELECTRIC ILLUMINATING CO. OF BOSTON

POSTER SENT TO JOBBERS AND DEALERS

A Conference of Executives from Scattered Territories

PUBLIC utility organizations which operate properties in widely scattered territories are more and more bringing their men together for conferences, as shown in this group of executives, district managers and engineers of the Union Power & Light Company at a recent meeting in Omaha, Neb. This company, which operates in South Dakota, Nebraska and southern Iowa, has made



GROUP OF UNION POWER & LIGHT COMPANY EXECUTIVES

a practice of holding an annual convention for the discussion of problems arising within the organization and to afford an opportunity for the interchange of ideas. Plant operating problems, the securing of new business and public relations were part of a well arranged program in addition to entertainment features.

What Other Companies Are Doing

Easton, Pa.—The number of meters on the lines of Pennsylvania Edison Company increased slightly more than 2,000 during the year 1921. This represents an increase of 20 per cent in the number of customers. The power requirements of the manufacturing plants in and near Easton are increasing, indicating renewed industrial activity in this section.

Binghamton, N. Y.—During the first two months of this year the Binghamton Light, Heat & Power Company showed a net gain in meters connected of 248. Twelve new power customers were added, their demands varying from one to thirty kilowatts.

St. Paul, Minn.—In patroling the high-tension lines of the Northern States Power Company good use is made of a dog-team patrol driven by Bert L. Baker, a full-blooded Pottawatomie Indian. This outfit has been in service for more than a month during a time when many of the roads have been impassable to ordinary traffic and without this dog-team patrol it would have been impossible to have sent out a "trouble shooter."

Providence, R. I.—Forty-five per cent more meters were secured on house and store-wiring contracts by the Narragansett Electric Lighting Company from Jan. 1 to March 5 this year than for the same period last year, and the campaign is still on to make 1922 a notable twelve months. Ten solicitors are in the field and with liberal financing by the company and close co-operation with contractor-dealers of demonstrated reliability they are accomplishing this in a territory at present sustaining the adverse effects of widespread textile labor troubles.

Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

Spare Parts Should Be Purchased from the Original Manufacturer

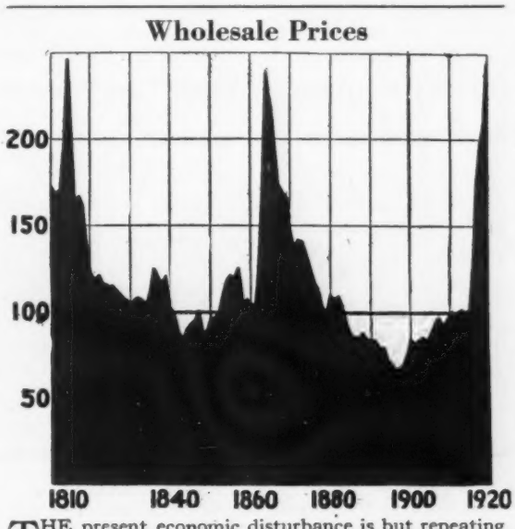
By F. H. Daniels
General Manager Sanford Riley Stoker Company
Worcester, Mass.

TO OBTAIN the best service from manufactured devices embodying extensive engineering design and close supervision in their production, spare parts should be purchased from the maker of such equipment. This is a principle which I believe should be more carefully presented to the purchaser of electrical and other machinery in order to build up a more appreciative point of view as to the importance of care in the replacement of parts.

Some users of stokers, for example, turn to local foundries when spare parts are needed to replace wornout pieces of the equipment. The local foundries make up patterns for these parts or pour castings from patterns built in some shop in the neighborhood, and deliver parts which vary greatly in quality for the required work in comparison with spare parts produced by the original makers of the apparatus. Not infrequently low cost is allowed to run away with accuracy in work of this kind, and as a result, the user replaces the original parts with inferior material of an incorrect design.

Even if the user of the apparatus succeeds in getting a perfect copy of the old part, which is by no means always the case, such a practice perpetuates the use of old designs after important improvements have been made by the equipment manufacturer. Where the buyer turns to the original manufacturer he gets the benefit of the latter's advice in reference to any changes in design. In a well-conducted manufacturing organization the engineering department is constantly working to improve the product and the detailed material and parts that are embodied in it. Field representatives, including sales engineers and construction men, are reporting to the home office important information bearing upon performance, and this information influences the designing work of the company and may result in particular instances in very important improvements in what are considered by the user minor parts of the apparatus.

These improvements tend to prolong the life of the parts and to increase the efficiency of service, under actual operating conditions where even small changes in equipment may yield far-reaching gains. A spare part which must be replaced because of wear or breakage should not be looked upon merely as a casting, because it really represents a great deal of thought and accumulated experience which the manufacturer desires to place at the disposal of the purchaser. In the long run, therefore, the equipment buyer best serves his interests if he avoids cutting corners in attempting to save small sums on replacement items and goes directly to the original maker of the equipment for parts needed to maintain the product in high-efficiency service. This policy is probably pretty thoroughly understood and practiced by the manufacturers of machinery themselves, but the trouble comes from the fact that they do not convey this bit of reasoning with sufficient care and attention to their customers. There is a widespread belief that users of machinery are penalized in the purchase of parts because the manufacturer thinks that the part cannot be obtained elsewhere and therefore that he can bear down heavily on the price. So occasionally we find the case where the user tries to beat the price by a call on his local foundry. It may pay well, therefore, if this point is impressed upon all users by the manufacturers who sell the apparatus, by the engineers or contractors who install it, and by the central-station companies, which are vitally interested in the satisfaction that it gives in service.



THE present economic disturbance is but repeating the history of both the Napoleonic and Civil War experiences. This curve shows just how wholesale prices advanced and then receded.

The Secret of Appliance Campaign Selling Is Right Methods

By Christian J. Litscher
President C. J. Litscher Electric Company,
Grand Rapids, Mich.

AS FAR as our experience has shown, this whole matter of whether or not the jobber can sell appliances profitably gets down to a question of methods. He can if he does it right. He can't if he does it wrong. And the most popular ways of doing it wrong seem to be, first, the handling of appliances through a jobbing house just as staples are handled with no real pioneering and merchandising support, and, second, the spasmodic campaign selling which too often starts too much and finishes too little.

In the merchandising of major appliances I find that the high-pressure campaign of one or two weeks seldom,

if ever, results in any particular benefit to the dealer, and I have come to the conclusion that good old-style plugging at the selling of a given article overshadows the value of one or two weeks' high-speed selling. We have in the past two years run a good many of these campaigns in developing our electrical dealers. This may have been necessitated by inefficient advertising or indisposition on the part of the dealer—our regular salesmen, who are supposed to be good salesmen, have failed in a good many cases to make sales while on the ground—but the plan leaves a bad taste in the mouth and very often discourages the regular salesman to the point where he loses interest in the sale of major appliances. He gives as his reason, as a rule, that if a high-pressure salesman could not put it over, he, with his inexperience, could not be expected to be successful. Furthermore, specialty salesmen, when they do sell for a dealer, very often, in order to close the sale, make promises which come to light later and sometimes are contrary to good business practices.

Our merchandising plan now calls for the education of the dealer and giving him the opportunity of buying his own experience. This method undoubtedly will not be quite so productive in immediate sales, but the writer believes it is the policy that in the long run will win out. In the smaller towns we find that very few of the dealers really know a great deal about the merchandise they are selling, and we believe the first requisite in local selling is to know the merchandise. We have therefore spent the last four months on ironing machines, having demonstrations in the dealer's store, not so much to educate the people of the town and demonstrate the machine as to educate the dealer himself in the possibilities of the machine and what it really can do.

We are trying to give the factory for which we distribute a real distribution; that is, we are taking our towns regardless of size and trying to get a dealer established in each community. While in a great many cases the dealer does not sell so many machines as the quota which somebody might figure out from the number of meters connected, we feel that to be represented in every town is the prime consideration and then it is up to us to develop the dealer so that he will do the selling himself rather than depend on our specialty man. From a jobber's standpoint we would very much prefer to have a hundred customers selling twenty machines a year in a hundred different towns than twenty customers selling a hundred machines in twenty towns. Then when we lose a customer we have not lost so much, and, furthermore, it gives us a steady business rather than a spasmodic business.

Frankly, I am through with high-pressure campaigns and am going to continue in the distribution of merchandise in the good old-fashioned way, keeping in mind at all times that a proper analysis of every town properly followed up is better than a "once-over," no matter how intensive the selling may be. With the proper education of the dealer, the proper study of the town and a quality appliance, the selling can be done successfully and profitably, and the jobber can make it a satisfactory business. To my mind the answer to the jobber on appliances is simple—he needs right methods of pioneering and merchandising, and nothing else will do.

It Only Requires a Little Confidence

A TIMELY suggestion to help put business into its regular stride. More confidence in the present and in future prospects will bring more business than any amount of brooding over the depression which has passed.

The Value of a Perpetual Inventory

TO A large degree success and profit in any business is dependent upon the maintenance and turnover of a balanced stock of material and supplies. Some of the advantages to be gained by manufacturers, jobbers and dealers through a perpetual inventory or stores control have been analyzed by the Fabricated Production Department of the Chamber of Commerce of the United States.

For those companies which are not satisfied that their material and stock investment is at an efficient minimum, which suffer periodically from shortages of supplies, which are unable to make monthly profit and loss statements, or fret at the prospect of the annual physical inventory, and are not adequately conserving their material investment by giving it the best of physical care, to such the perpetual inventory is recommended.

This alone will provide for:

1. Sufficient material to meet production requirements so that production shall at least not be checked by a lack of necessary material.
2. A minimum investment in inventories, which is of supreme importance at the present time.
3. An orderly and accessible arrangement of material and the physical safeguarding of material from the elements and theft.
4. The elimination of the burdensome and inaccurate annual physical inventory.
5. A monthly closing by giving the amount and value of material on hand at any time.
6. Is an invaluable record in case of fire loss.
7. A safeguard against the accumulation of obsolescent material.

When capital is in the form of cash, it is carefully protected, its receipt and disbursement safeguarded, its custodians held to a strict accounting, but once this capital is converted into materials there is a tendency to become lax, to lose sight of the value of the investment, to husband the capital less diligently and to tolerate practices that are wasteful, inefficient and needlessly expensive. The perpetual inventory will go far in correcting these conditions.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
of the World

Generators, Motors and Transformers

Squirrel-Cage Induction Motor.—J. T. TAKEUCHI.—The author explains the details of a squirrel-cage induction motor in which the stator winding is connected in extended delta at starting and reconnected in delta when the motor reaches its full speed. The general theory of starting the motor for this device is given, with experimental results and construction data.—*Journal of Institute of Electrical Engineers of Japan*, January, 1922.

Repair-Shop Prices for Rewinding Induction Motors.—Prices for rewinding industrial motors in two sections of the country, Detroit and Los Angeles, are given Special cases are not included in the article, so that in using these prices as checks against costs in any particular instance due allowance must be made for repairs to other than standard designed motors.—*Electrical Review and Industrial Engineer*, February, 1922.

Lamps and Lighting

Pathological Effects of Radiation on the Eye.—F. H. VERHOEFF and LOUIS BELL.—A study made by the authors on the various effects of light on the eye. The general conclusion regarding the effect on the human eye of radiation from practical illuminants is that no sources commercially employed for such a purpose are to be regarded as dangerous. The most ordinary care to insure comfortable vision is sufficient for complete security against all possibility of injury from radiation.—*Transactions of I. E. S.*, Vol. XVI, No. 9.

Factory Lighting Design.—J. R. COLVILLE.—Illumination layouts for various sizes of factory bays are given in this paper, which can be used by the practical man in much the same way as the building contractor uses standardized plans obtained from the architect. The designs can be applied directly, or with only slight alteration, to a wide variety of industrial interiors. Thirty drawings are given for bays varying in size from 12 ft. x 16 ft. to 25 ft. x 25 ft. and with a height ranging from 8 ft. to 19 ft. In each case data are given on the location and number of units per bay, the mounting height and the approximate average foot-candles at the work. Correction factors are also given for any obstruction such as comes from benches placed next to wall. A very extensive table covering all kinds of industries recommends the minimum number of foot-candles necessary for satisfactory lighting.—*Bulletin of National Lamp Works, No. 42.*

Generation, Transmission and Distribution

Hydro-Electric Plant at Buitreras, Spain.—F. REGARD.—An elaborate description of the electrical part of an up-to-date European hydro-electric station of 6,000 kva. rating, transmitting at 52,000 volts. All switches have remote magnetic control, overload time relays and simple lightning arresters, consisting of choke coils, water resistors and horns. To the high-voltage busbars is connected a dissonating arc-quenching coil (Petersen coil). Generators, switches and transformers are installed on the first floor, buses on the second floor and lightning arresters on the top floor.—*Brown-Boveri Mitteilungen*, January, 1922.

Operation of Oil-Burning Steam Power Plants.—C. H. DELANY.—To improve conditions and to interest men in the problem of plant efficiency it is essential to devise some means of comparing the performance of a plant from day to day. For this purpose the author has devised a "plant characteristic diagram." In this the

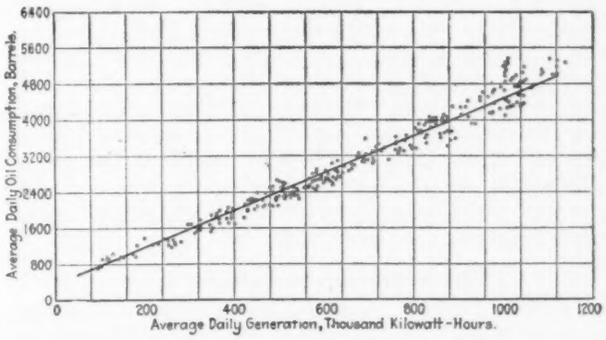


CHART USED IN A SAN FRANCISCO PLANT TO INTEREST MEN IN STATION EFFICIENCY

oil consumption is plotted against the kilowatt-hours generated. Each point represents one full day's operation, and while the points as shown are more or less scattered, they form a well-defined line.—*Iron Age*, Feb. 23, 1922.

Traction

Control Equipment of Paulista Locomotives.—P. W. FORSBERG.—Description of the control equipment on the freight and passenger locomotives used on the Brazilian railroad. Among the features emphasized are the regenerative braking system, current collection and methods of accelerating and motoring. The author also gives a diagram of wiring connections.—*General Electric Review*, March, 1922.

Electrification of the Klarälfvens Road.—E. WIST.—The high cost of coal and the abundance of available water powers were responsible for the complete electrification of this 171-km. road. The system chosen was 16,000 volts, single-phase, at 16⅔ cycles, which is the standard system adopted by Swedish roads. As, however, the special power house for this road cannot be finished for a few years, the road is being operated temporarily at 12,000 volts and 25 cycles, available from an existing power house at Krakerud, with an output of 12,500 hp. Catenary suspension, with a 40-sq.mm. carrier cable and a 65-sq.mm. profile wire on steel poles, was used throughout. Every 1,500 m. a tightening point is provided with 500-kg. weights. At present fifteen A. E. G. locomotives of type 1C1 are used on the line, the same type being used for freight and passenger service. The

engines weigh complete 40 metric tons and develop a pull of 4½ tons at 25 km. per hour. They are designed for a high speed of 60 km. per hour.—*Elektrotechnik und Maschinenbau*, Jan. 15, 1922.

Installations, Systems and Appliances

Manufacture of Synthetic Cast Iron in the Electric Furnace.—W. L. MORRISON.—A description of an installation for the manufacture of synthetic cast iron at Portland, Ore. Methods for carbonizing, the detrimental effect of excessive dry slags and the effects of aluminum upon cast iron are discussed. In conclusion, comparative cost of manufacture for various load factors are enumerated in table form.—*Chemical and Metallurgical Engineering*, Feb. 15, 1922.

The "Cyc-Arc" Process of Automatic Electric Welding.—L. J. STEELE and H. MARTIN.—This process of automatic welding has solved some of the problems of welding two pieces of metal of widely different sections by direct means and of welding dissimilar metals that have widely different melting points. The article discusses the evolution and development of this process, the automatic timing and control apparatus, various results of welding experiments and tests, metallurgical considerations and practical applications. Special machines for supplying power for direct-current welding are described. The article also considers the use of alternating current for the "'Cyc-Arc" process of electric welding.—*Journal of Institution of (British) Electrical Engineers*, January, 1922.

Electrophysics and Magnetism

Mathematical Theory of Induced Voltage in the High-Tension Magneto.—FRANCIS B. SILSBEE.—Three different circuits, representing in simplified form the essential features of the high-tension magneto, are developed and equations for the electrical performance of each are given. It is shown that by the insertion of proper electrical constants in these equations the resulting performance will be substantially the same as that of an actual magneto. Methods are suggested for the experimental determination of these constants, and the agreement between this theory and observed results is shown in certain cases.—*Scientific Papers of the Bureau of Standards, No. 424.*

Polarization Phenomena in X-Ray Bulbs.—S. RATNER.—Discussion of a procedure by which an X-ray bulb may be polarized, with the results of some experiments carried out on such a bulb.—*Philosophical Magazine* (London), January, 1922.

Units, Measurements and Instruments

The Tele-Compass.—With the use of two selenium cells, mounted above the compass dial and illuminated from underneath, it is possible to build a remotely indicating compass which is of great use on airplanes. The two selenium cells are arranged as the two branches of a Wheatstone bridge with a galvanometer as zero indicator. As long as the pilot flies in the predetermined direction the galvanometer will indicate zero.—*Industrie Electrique*, Jan. 25, 1922.

Theory of the Grassot Fluxmeter.—R. B. BURROWES.—The Grassot fluxmeter is a moving-coil, permanent-magnet instrument for measuring flux linkage in any circuit. In a theoretical discussion the author considers such questions as the back movement of the coils to the zero position, the non-synchronous movement of the coil with the flux changes, and the time constant of the throw and its independence of reactance and resistance. He proves that kinetic energy is proportional to the square of the throw.—*Electrician (London)*, Feb. 3, 1922.

Use and Construction of Current Transformers.—V. CANDIE.—A descriptive paper on modern types of current transformers manufactured by the French concern Société la Métallurgique Electrique and written by an engineer of this firm. Oil-insulated types for medium current capacity and high voltage and air-insulated models for voltages up to 30,000 and very high current, using straight copper bars as primary windings, are described. Characteristic curves of ratio correction, accuracy in relation to load and phase distortion are given. The very important question of short-circuit-proof construction of current transformers is not even touched upon.—*Revue Générale de l'Electricité*, Feb. 11, 1922.

Telegraphy, Telephony and Signals

Imperial Wireless Telegraphy.—A report of the Wireless Telegraphy Commission of England making recommendations regarding the sites and apparatus for the stations of the "imperial wireless chain." It includes a description of the development of high-power thermionic sets, the cost of valve renewals, the choice of wave length, transmitting antennas, masts and towers, the methods of reception and the design of receiving stations.—*Electrician (London)*, Feb. 3, 1922.

The Future of Radio Telegraphy.—CAPT. JOHN G. QUIMBY.—A résumé of the progress made in the use of radio telegraphy, with its application to navigation and transoceanic flights. In particular, the article recounts the developments of the radio compass and the possibilities of its use for surface craft. The author gives two methods for plotting radio bearings, followed by several examples.—*Proceedings of the United States Naval Institute*, February, 1922.

Miscellaneous

Electric Water Heaters.—A. GÖTTERT.—The paper describes a number of constructions of electric water heaters using either the principle of electrode heating or that of water-immersed resistance-heating units. The former can be used only on alternating-current circuits, as otherwise electrolytic action would take place. A combination water faucet and electric switch is used for the resistance type, to avoid running dry. Where a cheap rate for energy during the night hours is obtainable, a small electric heater connected to a well heat-insulated hot-water-storage tank is recommended. If properly insulated, the heat efficiency of such a storage system may be as high as 96 per cent. Additions of time switches and thermostatic control will avoid useless boiling and waste of current.—*A. E. G. Mitteilungen*, November and December, 1921.

Effect of Moisture on the Thermal Conductivity of Soils.—G. B. SHANKLIN.—It has been appreciated for many years that the presence of moisture in the surrounding soil is of assistance in dissipating the heat generated within an underground cable. This article shows that the relative thermal conductivity of various types of perfectly dry soils, such as sand, clay, gravel, etc., covers a range of only one to two, while the addition of moisture increases the range to five times or more that of dry soils.—*Journal of the A. I. E. E.*, February, 1922.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Jewett Receives A. I. E. E. Nomination for President

AT THE meeting of the board of directors of the American Institute of Electrical Engineers held in New York, March 17, the report of the committee of tellers on its canvass of the nomination ballots cast for candidates for the Institute offices falling vacant July 31, 1922, was presented. As required by the constitution of the Institute the board then selected by ballot its list of "directors' nominees," with the following result:

For president—Frank B. Jewett, New York, N. Y.

For vice-presidents—District No. 1, G. Faccioli, Pittsfield, Mass.; District No. 3, W. I. Slichter, New York; District No. 5, R. F. Schuchardt, Chicago; District No. 7, H. W. Eales, St. Louis; District No. 9, H. T. Plumb, Salt Lake City.

For managers—H. M. Hobart, Schenectady, N. Y.; Ernest Lunn, Chicago; G. L. Knight, Brooklyn, N. Y.

For treasurer—George A. Hamilton, Elizabeth, N. J.

The election ballots, including the names of the directors' nominees and all other eligible candidates, will be mailed to the membership prior to April 1.

Public Service Commission May Penalize Inadequate Service

IT IS within the power of a public service commission to order a refund to consumers where a public utility corporation fails to provide adequate service.

This question was determined on March 20 by the Supreme Court of the United States in affirming the decision of the Supreme Court of Oklahoma in the case of the Oklahoma Natural Gas Company vs. State of Oklahoma. The decision was handed down by Justice McKenna, without dissent.

The Oklahoma Public Service Commission ordered a refund to domestic consumers of 8 to 25 per cent on gas bills in Oklahoma City for two months when the supply of natural gas furnished by the company proved inadequate.

Hearings on Muscle Shoals Project Concluded

HEARINGS before the military affairs committee of the House of Representatives on the disposal of the government project at Muscle Shoals have been concluded All but two of the members of the committee expect to accompany the party of senators which will leave Washington March 25 on a special train to visit Muscle Shoals. The committee does not expect to begin the consideration of the project in executive session until after its return.

It is understood that Representative Kahn, the chairman of the military affairs committee, whose influence with the committee is a dominating one, is opposed to the acceptance of the Ford offer. He is understood to have reached this conclusion after having heard all the evidence laid before his committee. He entered the hearings rather favorably disposed toward the acceptance of Mr. Ford's offer.

The Republican steering committee of the House also is understood to be opposed to the Ford offer, but a new element has been injected into the situation, it is said, by the attitude of the Republican Congressional Committee. This committee is said to be convinced that failure to accept the Ford offer will entail serious political consequences at the congressional elections this fall. As a result it is understood that an effort will be made to influence the House to accept the Ford offer, particularly if it can be amended so as to come under the federal water-power act, and provided that a certain portion of the power will be made available for public utility purposes.

Hoover's Colorado Commission Favors Boulder Dam

ALTHOUGH the construction of the Boulder Canyon dam for the control of the Colorado River and the development of power would be an entirely feasible project from an engineering viewpoint, Secretary of Commerce Hoover, who is chairman of the Colorado River Commission, which is holding meetings in the West to gather data and sound public opinion on the development of the Colorado River basin, has expressed the opinion that in order to construct this dam under federal control it would be necessary to have legislation passed authorizing the work. Mr. Hoover said that to be sure of such legislation being passed it would be necessary to institute a campaign of education throughout the United States and crystallize public sentiment in favor of so large a program. He added that the difficulty of passing this legislation might be reduced because of the changing public viewpoint in regard to great reclamation projects.

Last week the Colorado River Commission held a two-day meeting in Phœnix, Ariz. At this meeting representatives of the several states concerned and of many smaller interests were represented and presented their views on the development and control of the river. No definite action is expected to be taken by the commission, which will hold meetings in several Western centers. Following the Phœnix meeting the commission visited the site of the proposed dam in Boulder Canyon, near Las Vegas, Nev.

After inspecting the Boulder Canyon dam site the party visited the Imperial Valley to get a first-hand impression of its needs for flood protection and then went to Los Angeles, where meetings were held Monday and Tuesday of this week. At these meetings dis-

cussion revolved around a proposed twenty-year holiday from litigation over the division of water and power between the states in which the basin lies. The important question of power development has been laid aside pending a solution of the problem of water rights.

Reclamation Service Report on Colorado River Completed

THE report on the problems of the Imperial Valley in California and vicinity, as required by act of Congress, has been made by the Reclamation Service. This supersedes the report made Nov. 27, 1920. The report recommends federal construction of a reservoir at or near Boulder Canyon, on the lower Colorado River, the government to be reimbursed by leasing the power privileges.

It is further recommended that the states interested may contribute to the cost of the dam and receive a proportionate share of power at cost. The Secretary of the Interior, it is recommended, should have the power to allow the various applicants their due proportion of the power privileges and to allocate the costs and benefits of a high-line canal. It is finally proposed that every development of the Colorado River by the government or others be required in both construction and operation to give priority of right and use (1) to river regulation and flood control, (2) to use of storage water for irrigation, and (3) to development of power.

Drury Government to Investigate Hydro-Electric Power Commission of Ontario

THAT the Ontario government was forced because of the enormous cost of the hydro-electric development at Chippawa and Nipigon to order an investigation of the Hydro-Electric Power Commission was the statement of E. C. Drury, Premier of the province, at a mass meeting called in Toronto Thursday, March 16, by the Federation of Business Men's Associations, the Retail Merchants' Association, the Bond Dealers' Association, the Rotary Club and the Board of Trade. The Premier declared that the Ontario government would insist on getting the facts. "I do not know—nobody knows," he said, "whether the money is being well spent or not; but the people have a right to estimates that are fairly accurate on which to base their judgment before passing on the projects."

In 1918 the engineers of the Hydro-Electric Power Commission estimated that 275,000 hp. could be developed at Chippawa for a total cost of $25,000,000, whereas Mr. Drury said the cost has now exceeded $65,000,000. Likewise at Port Arthur and Fort William, in the western portion of the province, the people were promised cheap power by the Hydro-Electric Power Commission, which erected a water-power plant at Nipigon. The estimated cost of the completed plant was between $4,000,000 and $5,000,000. Up to date over $6,000,000 has been expended and the plant is only partly completed. Power which was sold by a private company at from $15 to $17 a horsepower-year is sold by the Hydro-Electric Power Commission to the public in Port Arthur and Fort William for $21 a horsepower-year, and in addition the commission is piling up a yearly deficit of $300,000. "No business man," Premier Drury said, "would tolerate such estimates, which mount up without justification. Such a system is not a benefit but a burden, and that is why the government is stepping in." The policy of the Ontario government, Mr. Drury maintained, will be to see that the projects of the Hydro-Electric Power Commission throughout the province are directed along sane, sound business lines for the benefit of the people.

The work of the Hydro-Electric Power Commission is the most important undertaking at present under the Drury government, and the Premier said he was determined to see to it that every project was sound from conception to execution. The Chippawa station when completed will be the largest water-power plant in the world. Large sums of money have been spent on it and on other hydro-electric projects. For that reason the Premier was asked by the Toronto business organizations to make a pronouncement respecting the government's policy so that the public might have full and authoritative information.

Important Merger of Waterwheel Manufacturers

ADVICES from San Francisco state that the manufacturing plant and business interests of the Pelton Water Wheel Company of San Francisco have been purchased by the William Cramp & Sons Ship & Engine Building Company of Philadelphia, manufacturer of the celebrated I. P. Morris water turbines. This purchase marks one of the largest mergers of manufacturers of hydraulic equipment and turbines in the country. The Pelton Water Wheel Company will continue to operate under its old corporate name, but with new executive officers. H. B. Taylor, vice-president of Cramp's, will be president of the Pelton company; E. C. Hutchinson, formerly chief engineer for Pelton, vice-president and general manager, and W. B. Moody, second vice-president.

Work Started on New Western States Hydro Plant

THE Western States Gas & Electric Company has started work on the development of a new hydro-electric project in California which, when completed, will make the future purchase of energy from other sources unnecessary and will provide adequately for immediate and future demands for the company's electric service in the Stockton division. Authorization to build the plant was given last fall by the California Railroad Commission. Funds have been provided by the sale in March of an issue of $5,000,000 6 per cent bonds.

The present construction program, which will be completed by 1924, includes the erection of a hydro-electric plant with an initial capacity of 26,000 hp. in the canyon of the South Fork of the American River, above Placerville. Water storage at Twin Lakes will be enlarged to 16,000 acre-feet, the ultimate capacity to which this reservoir may be developed being 25,000 acre-feet.

The generating equipment in the station will consist of two units of equal size, driven by turbines operating under a head of 1,900 ft. A two-circuit steel-tower transmission line will be built from the power house to connect with the present transmission line near Placerville, a distance of about 10 miles, for immediate operation at 60,000 volts. The type of construction is such that the line voltage may be later increased to 110,000 volts.

Conference on Hydro-Electric Development Is Held in Philadelphia

FOLLOWING the practice established last year, a hydro-electric conference was held again in Philadelphia on Tuesday of this week. Eleven papers were presented on timely phases of water-power development and related subjects. Considerable interest was indicated by the large attendance of electrical, civil and mechanical engineers from various parts of this country and Canada. It was announced by the presiding officer, Dr. Arthur M. Greene, Jr., dean-elect of engineering at Princeton, that similar annual conferences are to be held in Philadelphia in the future. The conference was under the auspices of the Engineers' Club of Philadelphia and the Philadelphia Sections of the American Institute of Electrical Engineers, the American Society of Civil Engineers and the American Society of Mechanical Engineers, with the co-operation of the power division of the A. S. M. E.

Seven technical papers were presented, four of them relating to the Queenston-Chippawa power development. The remaining technical papers dealt with a new method of measuring water flow, evolution of turbine design, and the problem of unsteady flow or surges in open channels. Besides these papers there were four general addresses, namely, "Trends in Engineering Education," by Dr. Arthur M. Greene, Jr.; "The Public Utility Industry in the United States," by Samuel Insull; "Relations of Water Resources to the Country's Development," by Nathan Clifford Grover, and "Disposition of Hydro-Electric Power in Ontario" by P. B. Yates. Preceding the afternoon and evening sessions, which were held at the Manufacturers' Club, luncheon was served at the Engineers' Club. An informal dinner was held at the Bellevue-Stratford Hotel between sessions.

Samuel Insull referred particularly to the excellent financial condition in which electric service companies find themselves today compared with other industries, saying that this condition exists despite the troublesome times through which utilities have passed because of the steadily decreasing investment per kilowatt of maximum demand.

After reviewing the major uses to which water must be applied in various parts of the country, such as drinking purposes, irrigation, transportation and power purposes, Mr. Grover suggested that careful consideration be given to the relative importance of these uses in order that water may be used to the maximum benefit of the nation and locality involved.

Motion pictures showing the general features of design and construction of the Chippawa-Queenston hydro-electric plant of the Ontario Hydro-Electric Commission were presented by H. G. Acres, chief hydraulic engineer, and T. H. Hogg, assistant chief hydraulic engineer. The more important phases of the electrical equipment were illustrated by E. T. J. Brandon, chief electrical engineer. It was announced that two of the mammoth 55,000-hp. wheels are now carrying load and that the ultimate development will probably be 600,000 hp., the remaining units contemplated to be rated at 75,000 hp.

Features of one type of 55,000-hp. waterwheels installed were described by F. H. Rogers, who called particular attention to the methods of preventing leakage in these large units and the use of offset guide-vane levers to insure good speed regulation.

The design of propeller-type waterwheels having high specific speed at low heads was cited by L. F. Moody as a transition in the evolution of hydraulic apparatus which is bound to have a decided effect on power-plant design. A 28,000-hp. turbine of this type is being installed on the Hudson River to develop 56-ft. head, it was announced. According to laboratory tests, efficiencies of 86 to 88 per cent will be obtained. The speaker also compared the efficiencies of various types of turbines at different heads and specific speeds, it being brought out that very good efficiencies can be obtained at part-gate with propeller-type turbines having specific speeds of 85 r.p.m. to 144 r.p.m.

The paper by Mr. Yates, manager of the Public Utilities Commission of St. Catharines, Ontario, contained a mass of data on the rates charged residential and power consumers in Ontario and on the operating and maintenance expenses in various municipalities served by the commission. The author concluded by saying that the commission would continue to be a financial success so long as it is kept free from political control.

Prof. C. M. Allen described a new method of ascertaining fluid flow which only involves measuring the time between discharging a small amount of salt solution into a penstock and the moment that maximum water density occurs at some distance along the pipe. The maximum density is determined electrically.

R. D. Johnson presented a theoretical discussion on phenomena accompanying unsteady flow or surges in open channels.

Maintenance of Industrial Equipment Theme of Pittsburgh Section

MAINTENANCE of industrial electrical equipment was the main theme of a meeting on March 15 of the Pittsburgh Section of the American Institute of Electrical Engineers. The program was an innovation by reason of the fact that the discussion was limited to industrial operation. Among the main points in the papers was the consideration of the troubles which occur most frequently in steel-mill and coal-mining equipment. Suggestions for betterment of service were given. Emergency-connection schemes for department stores were also outlined. A. C. Cummins, electrical superintendent of the Duquesne works, Carnegie Steel Company, told of operating troubles and maintenance methods at that plant.

H. J. Nelms, general superintendent of the New Field By-Products Coal Company, Unity, Pa., talked on electrical operation in mines. He enumerated the most frequent electrical troubles and urged that central-station companies place coal mines ahead of any other industry in the matter of continuity of service. He suggested that designers should endeavor to perfect reel cables and that controllers for cutting machines and pumps should be constructed so that a ground on the circuits would prevent the machine from operating.

Mr. Nelms complained that motors of the present day will not carry the same overloads that older motors would handle without trouble. In reply to this Graham Bright, Westinghouse Electric & Manufacturing Company, pointed out that the rating of a motor is closer now to its actual ability than formerly. Competition, he said, prevented a manufacturer from giving a motor the excessive overload capacity which some of the old motors had. Eugene Friedlander, superintendent of

the electrical department of the Braddock works, Carnegie Steel Company, said that the man who applies the motor is responsible. He and not the manufacturer is to blame for troubles resulting from insufficient power in a motor.

To Build Six-Million-Dollar Steam Station for St. Louis Supply

THE Union Electric Light & Power Company of St. Louis is about to build a new steam plant to have initially two 30,000-kw. units and an ultimate capacity of probably 240,000 kw. The plant will cost upward of $6,000,000.

The company has purchased about 50 acres of land as a site for the new plant, which will be known as the Cahokia plant, on the Illinois side of the Mississippi River, immediately south of the city limits of East St. Louis and approximately 4 miles from the electrical center of St. Louis.

This power plant is intended to supply the rapidly increasing demands for electrical energy in St. Louis and vicinity, which is mounting beyond the available supply from the large water-power plant of the Mississippi River Power Company at Keokuk, Iowa, and from the company's own present Ashley Street steam-power plant. McClellan & Junkersfeld, Inc., have been engaged as engineers and constructors.

F. W. Smith Traces Alternating-Current Development in New York

MORE than 450 persons attended the luncheon of the New York Electrical League in New York City Wednesday, at which Frank W. Smith, vice-president of The United Electric Light & Power Company, described the development of the alternating-current system in the city of New York. The address was a most interesting and instructive one, tracing as it did the development of alternating-current generation, transmission, distribution and measurement from their commercial inception to the present date. The speaker referred to the time when even alternating-current generation was viewed askance and when there were grave doubts whether the voltages necessary for distribution could be conducted through underground circuits with the necessary reliability.

The illustrations presented showed in a most striking manner the wonderful strides which have been made in alternating-current electric service and led up to the most recent achievement of The United Electric Light & Power Company, namely, the 280,000-kw. (ultimate) generating station at Hell Gate.

As the speaker pointed out, this station not only ranks as a superpower plant, but it is unique in taking its condenser circulating water for each unit directly from the East River, thereby allowing the elimination of expensive tunnels. Among other features are the extensive and almost exclusive use of electric auxiliaries, the use of truck-type switchboards for station service, the isolation of switch and bus phases, the hydraulic sluicing of all ashes from below the boilers to underwater pits, the heat-balance system, the use of oil circuit breakers with the largest rupturing capacity in this country, and the provision of adjacent coal storage amounting to 100,000 tons.

Large Electric Service Expansion in New Jersey

IN THE annual report of the Public Service Corporation of New Jersey President Thomas N. McCarter calls attention to the year's business of the Public Service Electric Company, one of the subsidiaries:

"Overcoming the effects of the industrial depression, which caused a substantial decrease in the use of central-station power, the total revenue derived by the Public Service Electric Company from electric sales for the year increased 3.95 per cent. This net result was due to a growth of 18.49 per cent in sales for commercial lighting. A remarkable feature of the year's business and one which makes for permanency of revenues was a net gain of 45,912 in the number of meters, more than 90 per cent of which increased number were of the 5-amp. type, indicating the largest extension in the use of electricity for domestic purposes that the company has ever experienced in a single year. Average receipts per kilowatt-hour increased from 4.55 cents in 1920 to 5.54 cents in 1921, owing principally to the falling off of heavy power loads which were carried at the lower ranges of the rate schedule."

The net income of the holding company, after charges and taxes, amounted to $3,594,629. This is equivalent, after deduction of preferred dividends, to $9.19 a share earned on the $30,000,000 of common stock, and it compares with net income of $2,218,408, or $5.12 a share, earned in 1920. Details of the report are shown in the following table:

	1921	1920
Operating revenue	$75,311,507	$72,318,087
Other income	2,097,315	2,378,407
Total income	$77,408,822	$74,696,494
Operating expenses	51,769,627	52,638,939
Amortization charges	4,893,956	3,237,529
Net after taxes	$20,745,237	$18,820,026
Subsidiary companies' fixed charges	12,856,151	12,324,889
Public Service Corporation's fixed charges	4,294,458	4,276,729
Net income	$3,594,628	$2,218,408
*Preferred dividends	835,739	681,757
Common dividends	1,200,000	1,199,984
Balances	$1,558,890	$336,667
Miscellaneous debit	107,986	†18,658
Surplus	$1,405,904	$355,325

*Exclusive of that owned by Public Service Electric Company. †Credit.

In the balance sheet of Dec. 31, 1921, investments were shown at $106,739,399, against $107,145,749 in 1920; cash at $148,938, compared with $339,739 in 1920; accounts receivable, $19,766, against $11,237 in 1920; interest and dividends receivable, $166,232, against $157,497; accrued interest, $910,784, against $941,112, and accounts payable, $100,734, against $4,634 in 1920.

In his remarks President McCarter says:

"The company came through the year in a very satisfactory condition. Special attention is called to the amount of $4,893,956 which is plowed back into the properties of the company through the amount set up for amortization charges. In addition thereto a very considerable amount was carried to profit and loss.

"The future is full of promise. If the company is allowed to proceed in its great work of developing the state along the lines of its activities, without undue interference occasioned either by political agitation or unfair and ill-advised regulations, it believes it can perform a most useful service to the people of the state and yield to its security holders a reasonable return upon their existing and future investments."

Oklahoma Commission to Adopt Electric Service Rules

ELECTRIC service rules, including rules for making service extensions, were the subject of informal discussion before a session of the Oklahoma utilities convention at Oklahoma City last week. The discussion was under the leadership of B. P. Stockwell, electrical and gas engineer of the Oklahoma Corporation Commission. The rules were submitted for formal and final hearing before the commission early this week, and it is expected that they will be formally promulgated in a short time.

Public Relations Discussed by Oklahoma Utilities

THE basic eight-hour day is not sacred, the one-man, one-job rule of the unions is wrong if it causes economic waste, and a fair wage which will secure workers the necessities and a reasonable share of the comforts of life is essential. These are three of eight fundamental rules of practice that have been laid down by the Kansas Industrial Court, Judge W. L. Huggins of that court declared before the Oklahoma Utilities Association at Oklahoma City last week.

Judge Huggins said that there are three parties in interest in any litigation before the court, the public being the third, and the public always wins. He denied that the Kansas industrial relations law involved anything in the nature of involuntary servitude, and styled the law a new charter of liberty for labor.

J. H. Gill, in discussing "Co-operation in the Industry," claimed that co-operative moves in the electrical industry are too often founded on the selfish thought of what it will bring the individual, and fail for that reason. No one phase of the electrical industry can go ahead independently, said the speaker, but, if success is to be assured, all must work for the common good with a willingness to put more into the co-operative work than they expect to take out. Mr. Gill made a forceful plea for better relations between utility executives and the members of their organizations and particularly between company employees and the public.

In discussing the same question of public relations, C. A. Shock of Sherman, Tex., told a significant story of the success of a small telephone company based on whole-hearted co-operation in local affairs. This oftentimes led the company officers into unheard-of and astonishing fields but made them an indispensable part of the community.

That individual states never should have had the right to regulate railroad rates was the declaration of Noah W. Simpson of the Public Service Commission of Missouri, when he discussed what experience has taught in state regulation. The recent United States Supreme Court decision denying the State of Wisconsin the right to regulate its own railroad rates, he said, was the best for railways, people, utilities and the commissions, and the speaker did not hesitate to declare that too much of small-town politics had entered into state regulation of railroad rates. Utilities, he said, are entitled to have their cases tried before unbiased bodies and not through the newspapers and by political bodies. The speaker declared that the theory of reproduction cost new as a basis of rate making had never been heard of until the period of war-inflated values. He indicated a belief that as costs become lower such a basis might be the worst possible thing for utilities.

Announcement was made at the close of the convention of the resignation of H. A. Lane, who has been manager of the association since its inception in 1918. Mr. Lane was presented with a watch and chain by the members of the association, who wished him all success in his new position of assistant to Executive Manager Aylesworth of the National Electric Light Association in New York.

Officers for the coming year were elected as follows: President, F. W. Insull, Tulsa; first vice-president, Sherman Mooter, Hanna; second vice-president, J. C. Chestnut, Choctaw. The position of manager was not filled, but O. D. Hall, the assistant manager, was made acting secretary.

New Applicants for Water-Power Permits

THE application of the Louisville Gas & Electric Company covering the proposed development of power at Dam No. 41 on the Ohio River has been received by the Federal Power Commission. The project is expected to develop 25,000 hp., and it is the plan of the company to install equipment capable of generating 75,000 hp. The application is based on the probability that the government will increase the height of the dam by 6 ft. This matter is being studied by the Corps of Engineers, but it has not been determined finally.

The St. Cloud (Minn.) Public Service Company has applied for a preliminary permit covering the proposed development of 10,000 hp. at Rigby, 2 miles above Clearwater. It is planned to install 15,000 hp. for public utility purposes.

The State of Illinois, through its Division of Waterways, 25 East Jackson Boulevard, Chicago, has applied for a preliminary permit to cover a dam and powerhouse in the Fox River near Dayton, Ill. The power is to be used for public utility purposes.

Maxfield, Earnheart, Maxfield & Ward of Batesville, Ark., have applied for a preliminary permit covering the development of power at Government Dam No. 2, on the White River near Batesville. Primary power to the extent of 500 hp. is available at that point, it is estimated. It is the intention to install 1,200 hp. The power is to be used for manufacturing and public utility purposes.

The Grant's Pass (Ore.) Irrigation District has applied for a license covering a power project in the Rogue River just above Grant's Pass, where it is planned to develop power to pump water for irrigation purposes into a high-line canal. The primary power is 500 hp. It is planned to install 1,000 hp.

University of Florida Has Metermen's Course

A SIX-DAY metermen's course is announced by the College of Engineering of the University of Florida, Gainsville, Fla., to be held from April 10 to April 15 inclusive. It will include lectures by electrical engineering instructors of the university, addresses by engineers experienced in meter work, practical laboratory instruction in connections, tests, adjustments and repairs, and exhibits by leading manufacturers, with representatives in charge to explain them. No charge will be made for this course.

Boston Industrial Lighting Exhibit "Sells" $75,000 in Equipment

IT IS conservatively estimated that as a result of the first six months' use of the Bureau for Better Illumination at Boston $75,000 worth of equipment has been bought by consumers in eastern New England which otherwise would not have been purchased during that period. The exhibit is maintained in the Rogers Building, Boylston Street, by the co-operative efforts of the different branches of the electrical industry. More than 2,000 visitors have seen the display, and many delegations of central-station men, contractor-dealers, jobbers and representatives of manufacturers within and outside the industry have studied it.

Among recent lighting installations which have grown out of the display are those of the Grow Tire Company, Dover Stamping Company, Elastoid Fiber Company, Peabody Furniture Company, Newton public schools, Fall River Electric Light Company offices and American Printing Company. The Consumers' League of Massachusetts has indorsed the work, and recently Simmons College, Boston, has requested J. Daniels, illuminating engineer of the exhibit, to lecture upon lighting in its industrial hygiene course. J. E. Wilson, 263 Summer Street, Boston, is secretary of the bureau.

Illinois Utility Operators Discuss Electric Grading and Business Problems

ALTHOUGH public utility problems have increased in number since 1918, the Illinois utilities are especially fortunate in having 500,000 Illinois families as stockholders in their local utility companies, declared John F. Gilchrist in his address at Chicago last week before the joint session of the electric, gas and railway associations of Illinois. He attributed a great part of this faith in utilities to the work of the Illinois Committee on Public Utility Information, which is broadcasting pertinent facts on utility operation.

The Illinois State Electric Association on Wednesday afternoon listened to a discussion on the inspection and grading of electric service by J. Howard Mathews, service engineer of the Illinois Commerce Commission. Mr. Mathews considered fourteen factors which are necessary to grade this service. His first point was continuity of service. Next to continuity, voltage regulation is the most important factor. Handling complaints is another factor of much importance.

G. C. Neff of Madison, Wis., discussed the problems connected with rural electric service, his discussion containing an assumed problem comparing the cost of electric service for urban and rural districts. While all his assumptions were low, the increased cost for the rural customer over that for urban service was $34 per year. One-fourth of the population of the United States live on farms, and since electric service is desired on these farms, Mr. Neff urged that these extra charges be explained to the fullest detail to the farmers before the lines are built.

An investigation by A. C. Hall of St. Louis of the consumption of central-station energy per capita showed that the mining districts had a higher average monthly lighting load than industrial or agricultural towns.

On Wednesday afternoon John Leisenring of the Illinois Traction System presented a paper on inductive interference, discussing it from a construction, a priority and a legal standpoint. W. J. Canada in discussing this question said that the problem was now beyond the stage of mystery, and he urged a closer co-operation between all engineers in solving it.

In obtaining better business O. R. Hogan of the Commonwealth Edison Company mentioned his house-to-house appliance-selling campaign, which led to the sale of 9,000 portable lamps within eight weeks, using electric trucks as distributing points for sales.

The new officers of the Illinois State Electric Association are: President, D. E. Parsons, East St. Louis; vice-president, D. W. Snyder, Bloomington; secretary and treasurer, R. V. Prather.

Supply Manufacturers to Hold Summer Meeting at Spring Lake Beach, N. J.

AT THE meetings of the sections of the Associated Manufacturers of Electrical Supplies held during the week of March 13 it was voted to hold the regular summer section meetings at Spring Lake Beach, N. J., at the Essex and Sussex Hotel during the week commencing June 19. An interesting and varied program is already being arranged, as it is planned to make this the largest and best summer meeting the association has held.

The Fan Motor Section held its regular spring meeting on March 15 at the association rooms in New York. The meeting was an all-day session, nearly all the members being present and much constructive work was planned. The following officers were re-elected for the coming year: Chairman, W. W. Mumma, Robbins & Myers Company; secretary-treasurer, C. C. Remsen, secretary-treasurer Diehl Manufacturing Company. The manufacturers of laminated phenolic condensation products decided at a meeting on March 7 to form a section in the association covering this particular line. D. J. O'Conor of the Formica Insulation Company, Cincinnati, was elected chairman of the section; J. P. Wright of the Continental Fibre Company, Newark, Del., secretary, and J. W. Taylor of the Diamond State Fibre Company, treasurer. E. H. Ott of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., was appointed chairman of the standardization committee of the section. The section has laid out much work along standardization lines. Its next regular meeting will be held in June.

Public Hearing on Underwriters' Branch Circuit Rules

A HEARING will be held in the assembly rooms of the Chicago Board of Fire Underwriters of Chicago, 175 West Jackson Boulevard, beginning at 10 a. m. Tuesday, April 18, by the members of the standing committees on devices and materials and on wiring systems and standards of the electrical committee of the National Fire Protection Association to afford opportunity to all interested to express their views regarding a proposal which has been made to change Rule 23d and related rules of the 1920 edition of the National Electrical Code covering limitations upon maximum load of branch circuits.

The meeting will be in charge of A. Penn Denton, Seventeenth and Oak Streets, Kansas City, Mo., and A. R. Small, 207 East Ohio Street, Chicago.

It is the present plan to arrange for a second public hearing, probably in New York City, on or about May 15

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

An East Indian High-Head Plant.—An additional 100,000 hp. is to be made available for electrical transmission at the Gersoppa Falls on the Sharvati River on the Bombay-Mysore frontier in India. The development is being made by the Mysore state government. By the erection of a 120-ft. dam above the falls and by building a new power house at a point 150 ft. below the bottom of the falls a drop of 1,000 ft. is obtained. The cost will be £3,000,000.

Safety Council Making a Census of Safety Men.—The National Safety Council is completing a census which will determine the number of persons engaged in safety and industrial health work in public utilities and other industries. This census will enable the council quickly to find speakers on industrial and public safety for any occasion in any locality. It will also serve as a medium to obtain lecturers on accident prevention and industrial health work for colleges and universities.

Electricity and Milking in New Zealand.—In New Zealand, with a total population of 1,097,672, there are 8,806 dairies and farms that use electric milking machines requiring 2 hp. or 3 hp. each, and an annual increase of 16 per cent is recorded. In this fact, a local authority maintains, lies the main justification for much of the hydro-electric development under way in the island, with the projected network of transmission lines; for when all the 35,640 milking centers are equipped the total demand will form a very respectable rural load.

An Electrical Turnstile for Bees.—An ingenious method of counting has been brought to the attention of the Bureau of Standards by a member of the Bureau of Entomology, Department of Agriculture. The device, which is the invention of one of the members of that bureau, consists of a gate to be placed at the entrance to a beehive with a series of telephone message registers attached in such a way that every time a bee goes through the gate its passage is recorded. The device is operated electrically by alternating current. As about 300,000 bees go out during the day on honey-gathering expeditions, considerable electrical energy in the aggregate is needed to operate the recording gate, though the amount of energy expended by the device each time a bee passes is, of course, infinitesimal. An emergency device has also been devised to insure that the counting will continue from an auxiliary source of power in case of the failure of the main power circuit. Thus no bee will be able to leave or enter the hive without being counted.

One More Year of Daylight Saving in France.—A bill passed by the French Chamber of Deputies enacted that daylight saving should go into effect this year on March 25 as usual, but that in 1923 no change in the clock should be made. The vote in favor of discontinuing daylight saving next year was 299 to 229.

International Conference on High-Tension Transmission Systems. — The central office of the International Electrotechnical Commission announces that the verbatim report of the conference on high-tension transmission systems held in Paris last November will be published next month, in French and in English, by the Union des Syndicats de l'Electricité. The price of the report will be 60 francs if ordered before April 1, or at least 75 francs if ordered after that date. Those who wish the report should communicate with Tribot Laspierre, general secretary of the Union des Syndicats de l'Electricité, Boulevard Malesherbes 25, Paris, stating the number of copies required and whether in French or English.

Consolidation of Mining Engineering Publications.—The McGraw-Hill Company, publisher of the ELECTRICAL WORLD, has purchased the *Mining and Scientific Press* of San Francisco and on April 1 will consolidate it with the *Engineering and Mining Journal* under the name of *Engineering and Mining Journal-Press*. These two publications are the leading magazines of the metal-mining industry, the *Journal* having been established in 1866 and the *Press* in 1860. J. E. Spurr, editor of the *Mining Journal*, will be editor of the combined weekly, while T. A. Rickard, editor of the *Mining and Scientific Press*, will be contributing editor, keeping his residence in San Francisco and representing, in particular, the Coast and Western viewpoints. The combined publication will be issued in New York.

The Montefiore Prize Again Announced.—The triennial competition for the prize known as the George Montefiore foundation, which was won last year by Dr. J. B. Whitehead of Johns Hopkins University, is again announced by the Association des Ingénieurs Electriciens sortis de l'Institut Electrotechnique Montefiore, of which L. Calmeau, rue Saint-Gilles, 51, Liège, Belgium, is general secretary. This prize, amounting to 21,000 francs, is awarded for the best original work in French or English, exclusive of popular treatises and mere compilations, upon the scientific advance of electricity and its technical applications in any domain. Though known as the competition of 1920, the next award will be made in 1923 (last year's award was for the 1917 competition, similarly delayed by the war), and works may be submitted up to April 30 next year. The prize may be divided or awarded only in part at the discretion of the jury.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month

Tri-State Water and Light Association.—Spartanburg, S. C., will be the meeting place of the Tri-State Water and Light Association of the Carolinas and Georgia, when its convention is held on April 19, 20 and 21.

New Section A. I. E. E. Organized in Chile.—On the petition of members resident in Santiago de Chile, the executive committee of the American Institute of Electrical Engineers has granted authority for the establishment of a section in that city which will cover also Valparaiso and the surrounding districts.

Missouri Association of Public Utilities.—The Missouri Association of Public Utilities will hold its sixteenth annual convention at Daniel Boone Tavern, Columbia, Mo., May 4, 5 and 6. One session of the convention will be reserved for answering questions and problems of members. W. J. Canada, of the National Electric Light Association, will speak on "Inductive Interference."

April Meetings of A. I. and S. E. E.—These April programs have been scheduled by the sections of the Association of Iron and Steel Electrical Engineers: Cleveland, April 10, "Use and Abuse of Flexible Steel Ropes in the Steel Mill," by W. Voigtlander, John A. Roebling's Sons Company, Trenton, N. J.; Pittsburgh, April 15, "Selective Switching, Including Overload and Reverse Relays and the Interconnecting of Large Power Plants"; Philadelphia, April 18 (joint meeting), "Wireless Telegraphy, Telephony and Radio Control," by L. R. Krumm, radio engineer Westinghouse Electric & Manufacturing Company; Pittsburgh, April 22, "Heating Furnaces."

Coming Meetings of Electrical and Other Technical Societies

A. I. and S. E. E. Section Meetings—Youngstown, March 25; Birmingham, March 25; Cleveland, April 10; Pittsburgh, April 15; Philadelphia, April 18.
A. I. E. E. Section Meetings—Atlanta, March 30; Utah, March 31; Vancouver, April 7; Toronto, April 7.
A. I. E. E. Spring Convention—Chicago, April 19-21.
Tri-State Water and Light Association—Spartanburg, S. C., April 19-21.
American Physical Society — Washington, April 22.
American Electrochemical Society—Baltimore, April 27-29.
A. S. M. E. Spring Meeting—Atlanta, May 8-11.
N. E. L. A. Annual Convention—Atlantic City, May 15-19.
N. E. L. A. Geographic Divisions—Southwestern, San Antonio, May 3-6; Pacific Coast, Los Angeles, May 31-June 3; Northwestern, Boise, June 7-10; North Central, St. Paul, June 13-15.
A. I. E. E. Annual Convention—Niagara Falls, Ontario, June 26-30.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Price of Energy to Motion-Picture Theaters.—The Missouri Public Service Commission has ruled in a number of cases brought before it that the owners of a motion-picture theater are entitled to power rates and need not pay lighting rates for energy consumed in operating motors and current rectifiers.

Charges on Extraordinary Extensions Cannot Be Imposed on Domestic Consumers.—Finding against a water company that wished its rates to reflect the charges on extraordinary extensions made in war time for industrial customers, the Public Service Commission of Pennsylvania declared that the contention that a greater burden could be placed on domestic consumers than would have been required had the extension been made to meet their needs alone was not tenable.

Free Municipal Service, Off-Peak Service and Discrimination.—Electric service furnished to a municipality without cost, under the terms of a franchise, was construed by the North Dakota Board of Railroad Commissioners as an exchange for the use of the streets and alleys, rather than as free service. The commission, however, expressed its disapproval of this practice. In the same case, one which resulted in the reduction of the electric rates of the company supplying the city of Dickinson, the commission held the theory of off-peak rates to be reasonable but insisted on the same privileges in this regard being granted to all users of electricity for like service and not confined to the large consumers. Another dictum of the commission in this case was that "successful management, modern facilities and economical and efficient operation should be encouraged and rewarded, not by indirection through the creation of a mythical going value, but by increasing the rate of return."

Municipal Operation in Utah.—In granting permission to the Dixie Power Company to increase its electric rates, the Utah Public Utilities Commission referred to the fact that municipal plants in the state had sometimes undertaken to supply service at rates so low that disaster was invited. "Annual reports," the commission continued, "from municipally owned power plants would seem to be an argument in favor of public ownership, for the reason that energy is apparently furnished much cheaper than by private corporations. That is true, however, when you do not, in figuring costs of service, take into consideration the amount invested in the plant and system. The people are, by taxation, required to pay for the plant, generally purchased by the issuing of bonds, and likewise to pay the interest on such bonds for a series of years, and in fixing the rates to be collected from the public in a municipally owned power and light plant the commission does not take into consideration plant investment, interest and sinking fund on bonds. These amounts are taken care of by special assessments on general property of the city or town. Thus, in fact, a part of the rates only must be paid by the consumer, directly, while in private corporations rates necessarily are fixed to cover the balance of the rates paid in municipal operation, indirectly, and, as we have indicated, through taxes. So, after all, consideration must be given all the necessary elements in the giving of service, and whether it is a publicly owned plant or privately owned, the consumer of the energy cannot expect to escape the paying of the just cost of such service."

Extensions of Lines.—Order No. 1,692, on "Standards of Electrical Supply Service to Consumers," effective Feb. 1 last, has been issued by the Michigan Public Utilities Commission. Sections entitled "General," "Records and Reports," "Meters," "Tests Upon Application to Commission," "Transactions with Consumers," "Operation" and "Information for Commission and Consumers" are followed by the regulations governing extensions of lines, which in ordinary cases apply only where consumers contract to use the service for a minimum of two years. These line-extensions rules are as follows: *"Free Extensions.* — When a formal request for service is made of a utility by a prospective consumer or a number of prospective consumers grouped together in the same vicinity, it is recommended that the utility make free of charge such line extensions as may be necessary for giving service, and furnish free service connections, provided that the estimated gross revenue of a period of two years from such prospective consumers is equal to the direct cost of making the extension, and provided that the prospective demand shall be of such permanency and the probable future growth of the demand shall be such as will justify the capital expenditure required. *Restricted Extensions.*—If the direct cost of making a line extension is greater than the estimated gross revenue for a period of two years, then it is recommended that the following principle be made to apply: The utility may require the prospective consumers to furnish a subsidy equal to the difference between the direct cost of the extension and the estimated gross revenue for a period of two years, such subsidy to be refunded to the original prospective consumers in annual installments equal to 10 per cent of the excess of the annual gross revenue after the first two years above one and one-half times the average estimated annual gross revenue for the first two years."

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Unusual Definition of "Properly Insulated."—The Iowa Supreme Court has held, in Young vs. Electric Service Company of Central City, that in an action for damages based on a death caused by coming into contact with an electric light wire, the court did not abuse its discretion, in granting a new trial after verdict for defendant, by reason of its instruction that "properly insulated" meant to place in a reasonably isolated condition or situation without unreasonably interfering with efficiency of power lines. (185 N. W. 54.)*

Minnesota Federal Court on Basis of Valuation.—In fixing a gas rate for the Wisconsin-Minnesota Light & Power Company in a suit brought against it by the city of Winona because of exceptions taken to the report of the master, the United States District Court for Minnesota, First Division, asserted that the cost of reproduction less depreciation is not necessarily the value of a utility, that valuation must be based on reasonable judgment of all circumstances, that experience shows there is no such thing as a normal price to which costs of material and labor tend to return, that depreciation should be determined by inspection and not by theory, that the cost of financing is not an element of value without evidence of expenditure, and that cost of rate litigation cannot be considered in fixing rates. (276 Fed. 996.)

Powers of Michigan Commission.—In Taylor vs. Michigan Public Utilities Commission it has been held by the Supreme Court of Michigan that the commission is not without power to entertain a proceeding to fix rates to be paid a gas company whose franchise has expired, though the application was not made by the municipality, in view of the fact that the former Railroad Commission, whose powers were taken over by the Public Utilities Commission, could act on its own motion. Where, at the time an application was filed with the commission by consumers of gas to fix the rate to be paid a company whose franchise had expired, the city and the gas company were negotiating in good faith with a view of arbitrating the rate preliminary to the granting of a new franchise, the commission might in its discretion withhold action until they had an opportunity to conclude such negotiations, and the Supreme Court should not compel it to act by mandamus (186 N. W. 485.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

James H. Manning has recently been appointed engineering manager of Stone & Webster, Inc., with headquarters at Boston. Mr Manning is a graduate of the Worcester Polytechnic Institute, class of 1906. Following graduation he entered the employ of Hugh L. Cooper and served as designer and

J. H. MANNING

field engineer on a number of important hydro-electric projects. In 1910 he became a member of the construction division of Stone & Webster, Inc., and was superintendent of construction for Stone & Webster on hydro-electric projects for the Boston & Maine Railroad at Franklin, N. H., for the Truckee River General Electric Company at Reno, Nev., and for the Northwestern Electric Company at White Salmon, Wash. He was later transferred to the engineering division of Stone & Webster and was successively hydraulic engineer and consulting engineer. As such he was in charge of a large number of engineering and economic reports for Stone & Webster and their clients. In 1917 Mr. Manning was loaned by Stone & Webster to the American International Shipbuilding Corporation as chief engineer and was in charge of the general planning and detail design of the Hog Island shipyard. Early in 1919 he returned to Stone & Webster and became assistant engineering manager, in immediate charge of engineering work. He is a member of a number of engineering societies and also of the hydraulic power committee of the National Electric Light Association.

Dr. Lamar Lyndun, electrical engineer, has returned to New York after a prolonged absence in Paris. He is engaged in some private engineering work in this country and expects to return to France in about two months.

Pierce J. Kent, chief system operator of the Edison Electric Illuminating Company of Boston, has passed his thirty-fifth anniversary as a company employee, and in honor of the event a banquet at the Copley Plaza Hotel was tendered to him on Feb. 28, two hundred associates in the generating department acting as hosts. From the company Mr. Kent received a diamond-studded gold service pin and from the men under his supervision a set of electrical appliances. Mr. Kent is one of the best-known operating electrical engineers in New England. He is a native of Exeter, N. H., and has been in general charge of the handling of the Boston Edison electrical system since 1902. His development of the load-dispatching system used at Boston has given him a wide reputation in central-station circles.

S. L. Naphtaly has been elected vice-president of the Great Western Power Company of California and will be in charge of all of the activities and operations of that company. Mr. Naphtaly was born in San Francisco in 1875 and graduated from the University of California in 1896. Immediately thereafter he entered the electrical business and in 1899 was manager of the Central Light & Power Company of San Francisco. When this company was purchased by the San Francisco Gas & Electric Company Mr. Naphtaly became assistant engineer in charge of the electrical department. In 1902 he was promoted to the position of manager of the electrical department and in 1903 became general superintenednt and chief engineer. This position he held until 1905, when the San Francisco Gas & Electric Company was merged into the present Pacific Gas & Electric Company, at which time he became engineer of operations and maintenance in charge of electric operations. In 1907 he left to become associated with the City Electric Company of San Francisco, of which he was general manager and chief engineer. When this company was purchased by the Great Western Power Company Mr. Naphtaly became general manager of the latter company, remaining until 1913, when he resigned to complete the construction of the San Francisco-Sacramento Railway. He occupied the position of vice-president and chief engineer of the railway company. In 1917 he organized the Los Angeles Shipbuilding & Drydock Company, of which he was vice-president and general manager. That company built thirty-five steel ships for the government, and upon the completion of the work Mr. Naphtaly returned to the Great Western Power Company to take his present position.

Earl R. Ernsberger has been elected president and general manager of the Southwestern Cities Electric Company, Oklahoma City, Okla., and has also been elected president and general manager of the Keys Corporation, owning and operating oil and gas fields at Walters, Okla. Mr. Ernsberger has been actively engaged in public utility operation for the last fifteen years. He has made a special study of public relationship policies and has been a firm believer in the conducting of business on the "golden rule" plan. He is a

E. R. ERNSBERGER

graduate civil engineer and immediately after graduation followed that profession for several years, engaging in railroad work. He first became connected with electrical operations through the electrification of the Northwestern Elevated Railroad in Chicago but his real entry into the electric light and power industry was as chief engineer and general manager of the Mount Hood Railway & Power Company, Portland, Ore., an electric railway and hydro-electric power development. In 1913 he became connected with the Charles City Western Railway Company, Charles City, Iowa, as vice-president and general manager. Under his management this company was entirely electrified and put on a paying basis. In February of this year he was, as already stated, elected president and general manager of the Southwestern Cities Electric Company, which is a holding company for the Lawton & Duncan Electric Company, the Mangum Electric Company, the Lawton Gas Company, the Quanah Light & Ice Company and the Pecos Valley Gas & Electric Company.

Paul Liunde of the engineering department of the New York Edison Company sailed recently for Denmark for several months' stay. Mr. Liunde will investigate electrical installations in Denmark while in that country.

Daniel M. Fraser, formerly with the Canadian General Electric Company in Toronto as estimating engineer and acting superintendent of construction, has formed the Dominion Engineering Agency in Toronto and is its president. Mr. Fraser was born in Edinburgh, Scotland, in 1879 and was educated in that city at the Normal Training

D. M. FRASER

College and Heriot-Watt College. During the fifteen years following his graduation from college he acquired a wide experience in electrical and mechanical engineering, being employed on practical work as well as in the technical and commercial departments of power and central-station companies. He was employed successively by the Edinburgh Corporation at Dewar Place power station; Mavor & Coulson, Glasgow; British Engine, Boiler & Electrical Insurance Company, Manchester, and Drake & Gorham, Ltd., Manchester. He arrived in Montreal, Canada, in 1910 and spent some time with the Montreal Light, Heat & Power Company, leaving to go with the Mines Power Company, Cobalt, now the Northern Ontario Power Company. He spent several months during 1912 in England and Switzerland, investigating hydro-electric developments in the latter country. In October, 1912, he was appointed estimating engineer with the Canadian General Electric Company. Mr. Fraser is a fellow of the A. I. E. E. and a member of the Engineering Institute of Canada.

Bert H. Shepard has opened an office as consulting engineer in the City Bank Building, Syracuse, N. Y.

F. W. Pennock has resigned as vice-president and general manager of the Gleaton Company (of Canada), Ltd, to become connected with the firm of Gelinas & Pennock, consulting engineers, 207 St. James Street, Montreal.

C. B. Veit, formerly Chicago district manager for the Yale & Towne Manufacturing Company, has been transferred to the New England territory, of which, in addition to the territory in Canada east of Montreal, he will have charge.

C. H. Pearson, formerly New England district manager for the Yale & Towne Manufacturing Company, has been placed in charge of the Western and Northwestern territory for the company.

A. H. May, for the past three years works engineer for the General Motors Company, has opened an office in the Allen Theater Building, Windsor, Ontario, as a consulting electrical and mechanical engineer.

Kenneth Seaver, formerly assistant general manager of sales, Harbison-Walker Refractories Company, Pittsburgh, has been made general manager of sales. Mr. Seaver has been with the Harbison-Walker company for nineteen years.

S. F. Bowser has retired as president of S. F. Bowser & Company, Inc., Fort Wayne, Ind. The company was founded in 1885 by Mr. Bowser and since that time has grown to be one of the largest manufacturers of oil pumps and storage tanks. Mr. Bowser will be succeeded by S. B. Bechtel, until recently vice-president and general manager.

Charles M. Sullivan, formerly with Manning, Maxwell & Moore, Inc., as a sales engineer, has become district sales agent in Cleveland for the Kaestner & Hecht Company, Chicago, elevator manufacturers. Before his connection with Manning, Maxwell & Moore, Inc., Mr. Sullivan was Pittsburgh district sales manager for the Milwaukee Electric Crane & Manufacturing Company. He is a graduate of the electrical engineering course of the University of Illinois.

M. H. Schussler, the new vice-president of the Northern White Cedar Association, has been in the pole business since 1893, when he joined the Michigan Cedar Company at Minneapolis. In 1896 he was promoted to the managership and had charge of the sawmill,

M. H. SCHUSSLER

the logging railroad and the general store at Hunts Spur, Mich. When the Coolidge-Schussler Company was organized in 1899 he was elected secretary and treasurer and has held this position ever since.

George L. Washington, who has been a salesman in the Havana (Cuba) office of the Westinghouse Electric International Company, has been appointed assistant to the manager of the Havana office of that company. Mr. Washington attended the Alabama Polytechnic Institute of Auburn, Ala., from 1912 to 1916, being graduated with the degree

G. L. WASHINGTON

of bachelor of science in electrical engineering. He entered the employ of the export department of the Westinghouse Electric International Company in May, 1917, after completing the Westinghouse apprenticeship course. He entered the military service at the beginning of the war and was discharged Jan. 28, 1919, as first lieutenant of the Forty-sixth United States Infantry. Upon his return he was placed on order work in the Westinghouse International Company and later was transferred to the negotiation division. About eighten months ago he was sent to Cuba as a salesman in the Havana office.

Obituary

Albert E. Roberts, assistant chief electrical engineer of the Northern New York Utilities, Watertown, N. Y., was instantly killed on March 13 when a bare copper connector cable in his hands came in contact with a choke coil carrying 22,000 volts. The accident took place at the company's substation on Mill Street.

John H. Felthousen, chief engineer of the S. Morgan Smith Company, York, Pa., died at his home in York on March 5, after a brief illness. Mr. Felthousen, who was about sixty-five years of age, had been associated with the company named for many years and was identified with its activities in the development of modern water-power equipment. He had become one of the foremost figures in the hydraulic-turbine industry. His loss will be keenly felt by a host of friends and associates.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Pole Prices React Upward

AFTER a protracted series of downward revisions prices of some sizes of Western red-cedar poles have finally been raised. The change amounts to only about 5 per cent and applies only to a few of the larger sizes, such as the 35-ft. and 40-ft., but it shows the healthy tone of the market and the lowering of pole stocks of those sizes. One of the main reasons for pole producers bringing their prices as low as they were around the first of the year was the possession of small stocks by outside brokers who were willing to undersell the nominal market. These "outside" stocks have been practically cleaned up, it seems, and the producers are again able to bring their prices to what they consider a reasonable level. Stocks cannot be replenished from the woods for several months, and the new prices can be maintained at least until that time. Developments then are not being predicted; the supply of poles from the woods this year is reported not to be so large as last year's, and by the time these stocks arrive demand may have picked up so that prices can maintain the new levels.

Good Inquiries for High Tension Insulators with Sales Lagging

THE near approach of good outdoor construction weather has brought a large number of inquiries from insulator purchasers, and manufacturers are confident of a good spring season. Sales during March have dropped somewhat below those of the first two months of this year but are slightly better in volume than in March, 1921. This drop from January and February totals is accepted by producers as merely one of the ups and downs of present-day business and has not lessened the belief in a good spring season. Contemplated construction of important lines is reported from California and the northern Pacific coast, while numerous small extensions of transmission lines are expected in the Middle West. These undoubtedly will be small individually, but in the aggregate should bring considerable business to manufacturers of pole-line material.

A reduction of about 5 per cent has just been put into effect on suspension-type insulators by several of the larger manufacturers, the cut to apply on all sizes. Prices of other types have not changed recently. Whatever reduction has been accomplished to date—estimated at about 30 per cent below peak—has been accomplished by cutting labor costs, according to one manufacturer.

Labor, this producer said, has borne most of the burden of readjustment, while raw material and sales costs have escaped liquidation almost entirely. Labor costs, he continued, have been forced down to the very bedrock and the only hope for cheaper porcelains is downward revision of raw-material prices, greater economy in distributing and sales organizations and lower freight rates. Power companies, however, he added, were not dissatisfied with prices, and he felt that buyers would not hold off on this account as they did last spring. A factor in this is the growing realization that manufacturers are producing much better insulators at only slightly higher prices than in 1915. The producers assert that insulators of the 1915 quality could be purchased now, if they were being made, at less than 1915 prices.

Competition has become keener lately because of the presence in the field of a number of smaller manufacturers. This is affecting sales of insulators under 50,000 volts and particularly the 2,300-volt to 6,600-volt sizes. Only the well-established producers have the facilities to make the very large sizes and price concessions are not so noticeable on jobs of that size.

Storage Battery Sales Increase Since First of Year

THE storage-battery business is good and the outlook is bright for increased sales in 1922, in the opinion of H. B. Gay of the Electric Storage Battery Company, Philadelphia. There has been a satisfactory increase in sales in the past two months over the corresponding period of 1921, and Mr. Gay stated to a representative of the ELECTRICAL WORLD that at present a good volume of business is being closed.

"New sales are naturally dependent upon general conditions, and the readjustment of business is already having its good effects," he said. "The storage-battery business is like that of other industrials depending upon trade developments. In this connection can be mentioned the railroads and farmers. The railroads have limited their purchases to the minimum during the past few years and have piled up orders for needed material. Orders are now beginning to come from these companies in the shape of new business as well as for the needed supplies. The general adjustment of prices of food to a more stable basis has increased demand that has been felt from the farmers; they are now ordering in larger quantities.

"The storage battery is an essential and indispensable part of many different kinds of electrical systems and apparatus, and the field for renewals and replacements is large. The reduction in price of batteries is also a contributing cause of increased sales. Character of the inquiries for this year is better than for the year previous. More settled conditions in Europe will, I believe, stimulate export business."

No Signs of Slacking in Demand for Radio Apparatus

DESPITE the efforts of manufacturers of radio apparatus to catch up with the demand for their product, deliveries are still far in arrears and orders continue to come in in ever-increasing volume. The larger manufacturers are not yet ready for deliveries in quantity, though the announcement has been made that there will be a normal supply for the country within the next six weeks. In the meantime dealers and jobbers are scouring the country in an attempt to find something with which to placate their customers and are discovering the same situation in all jobbing centers. Moderate supplies were supposed to exist in Cleveland, Detroit and Pittsburgh, but one dealer recently in New York said that he had not been able to buy enough in these cities to supply even the wants of his small community. In New York the large demand of two months ago has grown to such proportions that several dealers have had to close down their radio departments for several days at a time because of inability to obtain supplies. Stocks of head sets have been particularly short.

The Radio corporation, the sales agent for the Westinghouse Electric & Manufacturing Company and the General Electric Company, has announced to the trade that the pres-

ent shortage should be overcome within the next six weeks owing to the greatly enlarged production of these two companies. At the present time considerable quantities are being shipped to the jobbing outlets of various manufacturers, but because of the desire of these jobbers to supply old customers first the majority of the dealers have not benefited by the increased production as yet. This applies particularly to those dealers who have just recently installed radio departments but have been unable to obtain enough stock to really keep them going.

One of the older manufacturers of radio apparatus has just made plans to quadruple output, though only a short time ago the original production of the plant had been doubled. This company is making partial delivery now on all orders accepted in from three to six weeks and in from five to eight weeks will deliver in larger quantities. After April 1, according to present plans, deliveries will run two to four weeks, while immediate delivery will be given after June 1.

Sales of Irons Running Ahead of Last Year

PURCHASES of electric irons by wholesalers and dealers since Jan. 1 have been considerably ahead of those for the same period of 1921, according to a survey of that market just completed by the ELECTRICAL WORLD. January and February are recognized as lean months on account of seasonal conditions, but even so the volume of sales by manufacturers has been only slightly below that of last August and September, normally the two busiest months of this year. This revival of demand has led manufacturers to predict that 1922 will go ahead of 1921.

Viewed from the angle of stocks on hand there is also room for optimism. Both jobbers and dealers turned into 1921 with large supplies of irons on hand. Bit by bit, aided by several price reductions throughout the year, these stocks were worked off, and by January last many jobbers and retailers were on a hand-to-mouth basis. It is true that orders are still small, but their frequency shows a good turnover, which is more to be desired than large sales to distributers with the attendant delay in the repeat order. Retailers report a satisfactory movement of flatirons to the public, a movement which is shared by most of the appliances selling at low prices.

Deliveries can be had immediately on the small orders going through at present, and a majority of the manufacturers interviewed stated that under the conditions anticipated deliveries will continue normal. However, surplus stocks have been cut down even by the manufacturers, and concerted buying such as that of 1919, would probably result in temporary delays in shipment.

Prices are regarded generally as stable. There were three downward changes in 1921 and another slight revision on Jan. 1, 1922.

Rigid Conduit Manufacturers Expect Heavier Spring Demand

A MORE active demand than at any time in the last two years is anticipated this spring by manufacturers of rigid conduit. Sales of pipe have held up very well all winter, and at the present time production is on a comfortable basis, though practically no plants are working on a capacity basis. The effort to spread out this business during the winter has been successful, and thus the sales curve has not shown the peaks and valleys noticeable in other lines.

Though of satisfactory volume, the demand has been of a more or less hand-to-mouth character, and stocks now are small. Contractors have ordered by the job, and jobbers with a few exceptions have kept their stocks so low as to have to pass on orders direct to the manufacturer. The result will probably be a temporary shortage early in the spring, for manufacturers also have cut down stocks. Building should not be seriously affected by such a shortage, for there is usually a moderate length of time intervening between the placing of the order and the actual use of the material in the job. However, such a condition would have a healthy effect on quotations.

A good amount of business should develop within the next three to four weeks, according to one manufacturer. Big building projects are maturing in New England, New York, the Southeast, Chicago and the Pacific Coast, all of which will consume a considerable amount of pipe. The Pacific Coast in particular is proving a worth-while field, distributers of one concern having taken at least two cars a week, and often more, for several months past. The Southwest, including Texas, has been an active market, but the Middle West and the Southeast have been quiet. Both New York and New England have been absorbing a good volume.

Metal Market Situation

DOMESTIC purchases of copper fell off last week and the market sagged somewhat in consequence. The development was not unexpected, however, after the activity of the preceding two weeks. Foreign buying did not recede to as noticeable an extent as did domestic, but sales to that market were actually smaller and prices went off about an eighth of a cent. As a result of the turn of affairs there were freer offerings by some producers for second quarter as well as for prompt deliveries. Some of the smaller producers also solicited business for the third quarter at prices which would not have been accepted a few days before. The prevailing price at the beginning of the week was 13 cents delivered for domestic shipment in March and April, as well as 13 cents f.a.s. New York for export.

Consumers, nevertheless, continued to be cautious and not much buying was reported at this price. The demand for finished copper products is improving slowly but steadily, but most of the manufacturers seem to have provided for their needs for the next thirty days and are not disposed to anticipate future requirements. Wire and rods went ⅛ cent higher last week as a result of the large buying.

Much of the recent upturn of the market is laid by one commenter to unusually good foreign sales, which were reported to exceed even domestic orders. During the first part of March England was a large buyer while Germany came back into the market on a moderate scale. Scattered orders from France, Italy and the East have combined to raise the volume of foreign business. Imports of copper into the United States in January, according to the Department of Commerce, were 12,880,483 lb., the smallest monthly imports reported since September, 1920. Exports in January amounted to 54,808,928 lb.

There is a stronger tone in the lead market in the West, and this is being confirmed by the placing of good-sized orders for April shipment at the stronger prices. Dealers as well as consumers are in the market for that position, and there is also a good demand for May, which however, producers are not disposed to quote. Business has been done for soft Missouri brands at 4.52½ cents Chicago.

NEW YORK METAL MARKET PRICES

	March 14, 1922	March 21, 1922
Copper:	£ s. d.	£ s. d.
London, standard spot	60 12 6	59 2 6
	Cents per Pound	Cents per Pound
Prime Lake	13.00–13.25	13.00–13.25
Electrolytic	13.00	13.00
Casting	12.62½	12.62½
Wire, base	14.00	14.00–14.25
Lead, Am. S. & R. price	4.70	4.70
Antimony	4.15	4.25
Nickel, ingot	41.00	41.00
Sheet zinc, f.o.b. smelter	8.00	8.00
Zinc, spot	5.00–5.05	5.05
Tin, straits	28.87½	29.00
Aluminum, 98 to 99 per cent	19.10	19.10

OLD METALS

Heavy copper and wire	11.00 –11.25	11.00 –11.25
Brass, heavy	5.00 – 5.50	5.00 – 5.50
Brass, light	4.75 – 5.00	4.75 – 5.00
Lead, heavy	3.75 – 3.87½	3.75 – 3.87½
Zinc, old scrap	2.25 – 2.50	2.25 – 2.50

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

LAST week in the electrical trade was uneventful, but business continued to plug steadily along and March, it is believed will show a better volume of sales than either the preceding month or the same month last year. Building remains active in most of the centers of business and continues to require steady shipments of wiring supplies, and there is more or less spasmodic activity in other electrical lines. New England is improving industrially, better conditions being noted in the construction and metal-working fields; more active buying of industrial lighting equipment and lamps is noted there. Atlanta reports the best week in several months, owing to better weather. Chicago business is quiet, but better motor business than last year is reported there, and St. Louis observes greater activity in industrial electrical supplies. In the West conditions are spotty, but both California and the Northwest report business picking up.

NEW YORK

Some improvement in the sale of wiring materials was noted by the jobbers last week. This is attributed almost wholly to the increase in residential building which has been brought about by the approach of spring. During the last week there has been a most significant increase in the amount of new construction placed under contract, and the volume of newly reported building in prospect is far in excess of the most optimistic predictions of a short time ago. Figures for the territory including all of New York State and New Jersey north of Trenton show that during the tenth week of this year there were first reports on 777 new building and engineering projects in this district that will involve a total outlay of approximately $37,158,900. During the same period there were 342 contract awards announced that will require a total expenditure of $20,397,600. Residential building, both prospective and actually under contract, is by far the most important in volume and cost, and there is every reason to expect that this character of construction will dominate the building situation throughout the coming season.

Prices remained virtually unchanged and jobbers' stocks are fair to good on all items. Price competition is still in evidence, although it is not so keen as formerly.

Rigid Conduit.—A slight adjustment of prices was announced by manufacturers, but it was not sufficient to affect jobbers' quotations. Prices this week were as follows: For ½-in. black pipe in 2,500-ft. lots, $44.50; ¾-in., $58.10, and 1-in., $82.79 per 1,000 ft. Galvanized pipe in the same sizes and quantities was quoted at $50, $64.50 and $92.20 per 1,000 ft. Demand is only fair with stocks generally good.

Wire.—No change of price or of conditions in the wire market was noted last week. No. 14 rubber-covered is quoted at $6.25 to $6.35 per 1,000 ft. in 5,000-ft. lots. Demand is moderate and stocks are good.

Flexible Armored Conductor.—Prices for this material remain uncertain. No. 14, two-wire, single-strip, is quoted at $43 per 1,000 ft., and double-strip at $45 per 1,000 ft. in that quantity. Quotations on similar material have been made at $40 per 1,000 ft. for single-strip and $42 per 1,000 ft. for double-strip. Demand is good, and stocks in the hands of both jobbers and manufacturers are reported to be small.

Lamp Cord.—Demand is moderate and stocks are good. No. 18, cotton, twisted, is quoted from $11.65 to $12.75 per 1,000 ft. in that quantity. No. 18, cotton, parallel, is quoted at $14.50 to $15.45 per 1,000 ft.

Dry Cells.—Batteries are moving fairly well and jobbers' stocks are good. Igniters in barrel lots sell for $30 per 100.

Metal Molding.—There is a moderate demand for this material and stocks are ample. In lots of 1,000 ft. the three-wire size sells for $5.50 per 100 ft.

Fans.—Jobbers report that their fan business this year promises to be much better than last as the dealers are placing fair-sized orders for early delivery in response to contracts sent out about a month ago. Prices on 12-in. and 16-in. fans are from 10 per cent to 13 per cent lower than last year.

CHICAGO

Only a few changes were noticed last week in the electrical trade either in price or demand. While there was a steady volume of wiring materials moving to contractors, no tendency to increase stocks was found and hand-to-mouth buying still exists. Conduit is still selling at varying prices. Manufacturers of high-tension equipment report more interest in this line and feel that spring business will be good. The price reductions on motors produced very little increase in buying, but most dealers say that this year's business so far is better than that of 1921.

During the week the citizens' committee to enforce the Landis award announced that it had insured for $28,000,000 505 jobs, ranging from bank buildings to cottages and employing 5,594 workman of all trades.

Rigid Conduit.—Jobbers' quotations vary widely, ranging from $40 to $42.50 per 1,000 ft. in 5,000-ft. lots for the ½-in. black pipe. The demand the past week has been moderate but steady. Stocks in jobbers' hands are good.

Flexible Armored Conductor.—Sales have been steady and most jobbers' stocks are being replenished by shipments from manufacturers. Prices have been shaded a bit, and the No. 14 two-wire, single-strip, is available for $43 to $45 per 1,000 ft. in 5,000-ft. lots.

Wire.—A fair volume of sales on No. 14 rubber-covered wire during the past week has been reported, and prices have remained steady. Quotations on No. 14 rubber-covered range from $6.25 to $6.35 per 1,000 ft. in 5,000-ft. lots, and dealers' stocks are in fair condition. An increased demand for weatherproof has been noticed due to spring building, but the price still remains at 16¼ cents per pound. The bare wire market has been active and stocks are ample.

High-Tension Equipment.—Reports from manufacturers indicate that spring activity has started. Orders for a 1,500-kva., 22,000-volt outdoor substation for a Northwestern central station, three 600-kva., 33,000-volt outdoor substations for a Middle Western utility and a 13,200-volt, 600-kva. substation for the South were received during the week by one manufacturer.

Poles.—Nearly all dealers say that they have realized a bit of the increased spring business on this equipment. An increase in price on Western red cedar poles has been noted. The 7-in., 30-ft. pole sells for $7.80, and the 7-in., 35-ft. pole for $11.60 f.o.b. Chicago. Stocks are in good condition.

Motors.—The average 10 per cent drop in price on polyphase induction motors has not stimulated trade to any noticeable degree, although dealers report more activity. They feel that this improvement is purely a seasonal one and was in no way affected by the price change. One dealer tells of receiving orders for several 150-hp. motors. Another company reports its 1922 motor business to date better than that of 1921 by 7 or 8 per cent. A 3 to 4 per cent drop in single-phase motors is reported by one company. All dealers say their stocks are in good condition.

Safety Switches.—Sales are steady and not confined solely to the standard 30-amp. household switch. Orders for the larger types, ranging from 100 amp. up, have been reported by dealers. Stocks are ample for current needs.

BOSTON

Underlying conditions continue to improve slowly in the electrical industry. Trade is better in many lines than last month, notwithstanding the effect of textile strikes in various localities in New England. For the latest reported week building and engineering contracts placed in New England totaled over $3,900,000, a gain of nearly $1,000,000 over the same week a year ago. The metal industries are showing more activity. House-wiring campaigns are bringing excellent results in several places and central-station outputs in representative plants show substantial gains over last year. Prices are fairly firm, barring readjustments which do not represent pronounced changes all along the line. The shortage in radio-telephone apparatus continues, and it was reported Monday that some of the smaller sizes of bare copper wire for aërials were difficult to obtain promptly. Competition for trade among distributers is exceedingly sharp, but the public is coming into the market more and more, though nothing like a boom is apparent. Municipalities are showing much interest at present in public building and especially schoolhouse illumination.

Motors.—A much better feeling is evident. Sales are largely confined to sizes not exceeding 10-hp. rating, though occasionally much larger motors are required. One distributer noted an improved demand last week for polyphase equipment.

Lamps.—The demand holds up remarkably well, and a leading distributer reported Monday sales ahead of last year's. Considerable industrial-plant buying of lamps is under way, after a long period of low ordering for replacement. The demand for lamps for window lighting and for projector work is also fairly active. Larger-sized units are in much favor.

Wire.—Competition is extremely acute. A 3,000-lb. order was decided last week by one purchaser on a quotation difference of only $7.50 for the lot as between a manufacturer and a jobber. Little demand for bare wire exists except for radio aërials, and No. 14 seven-strand copper was hard to obtain promptly the first of the week. Rubber-covered No. 14 wire is quoted all the way from $5.80 to $6.25 per 1,000 ft. in 5,000-ft. lots. Weatherproof base is 15 cents.

Sockets.—A light demand features the market, with much complaint of narrow margins of profit among jobbers. In some cases business is better than earlier in the year. The ruling price on pulls in case lots is 31½ cents net, keys moving at 18 cents and keyless sockets at 16½ cents.

Rigid Conduit.—Small-lot sales are going through, 500-lb. orders or less from contractors to jobbers being common. Prices on ¾-in. black and galvanized conduit in less than 500-lb. lots are respectively 7 cents and 7.5 cents per foot from Boston jobbers' stocks.

Fixtures.—A fair demand is reported. Fixtures for public buildings and mercantile establishments are moving most actively, and a growing trade in equipments for residential service is anticipated as building operations increase. A large amount of scattered house construction is apparent in the suburban Boston district.

Meters.—A moderate demand is apparent, which bids fair to improve as the season advances. Some mercantile meter installations are helping to round out the present light output of manufacturers in comparison with their total facilities.

ATLANTA

Some improvement in business conditions is reported this week for the first time since the beginning of the year. There have been a few consecutive days of good weather, and this is having an excellent effect both in the cities and in the rural communities, allowing building construction to continue in the cities and giving the farmers an opportunity to get started on spring planting. According to the report of the building inspector in Atlanta, 401 homes have been completed since Jan. 1, establishing a record in the city's history.

There is little cash money in the small towns and rural districts, except where industrial-plant payrolls are being spent, and as a result collections are rather slow with no likelihood of the money market easing off until well in the summer months. Public works construction is tending to help the situation materially, the State Highway Commission announcing that it will construct $4,000,000 worth of roads this year, while municipal improvements, such as installation and expansion of waterworks, sewerage systems, schools, etc., will help still further.

A great deal of interest is being displayed in radio equipment, two of the large newspapers in Atlanta recently announcing the installation of broadcasting stations. This particular line is helping materially to sustain the sales volume of a number of jobbers and dealers in this section.

Portable Drills.—The continued slowness in the automobile and garage business is reflected in the slackening demand for portable drills, though a few sales are being made to industrial plants. Local stocks and factory shipments are both reported good, with prices steady.

"White-Way" Lighting Equipment.—There is considerable activity in this line, municipalities displaying a great deal of interest in improvements and expansions. Factory shipments are reported quite satisfactory.

Panelboards.—Panelboards continue to sell well, the small sectional boards leading in popularity, though some of the larger lighting and power panels are moving.

Electric Ranges.—Certain sections of the territory report considerable activity, particularly South Carolina and Florida. Jacksonville announces a range campaign for this spring which should serve to place a fair quantity. Local stocks are in good shape, with prices unchanged.

Fans.—Fans are becoming quite active with the prospects splendid for a good season this year. Jobbers have placed orders approximately equal to those of 1921 and are beginning to actively push this line of business.

Printing-Press Equipment. — This line continues quite active and a number of very satisfactory orders have been received recently. The orders are about one-third for direct-current and two-third for alternating-current equipment, with the three-phase type of apparatus predominating. Local stocks are in fair to good condition with shipments satisfactory.

Exhaust Fans.—Movement is beginning again, especially in the small and moderate-size types, the 18-in., 24-in. and 30-in. being most popular. Prospects for summer business are good with stocks at present fair to good. There is a rumor of price reductions in the near future, though there is nothing definite obtainable as yet.

Oil-Engine Generating Sets.—Sets in all sizes up to and including the 200-hp. size are reported very active, the larger sets being particularly in demand in south Georgia, south Alabama and Florida. The house-lighting and small commercial sets are also moving quite satisfactorily. Local stocks of the smaller types are fair, with shipments on the larger sets on about a six-week basis.

ST. LOUIS

Another labor group, the cement finishers, has contracted with the builders on a basis of 20 per cent wage reduction, and, with negotiations under way with the other groups, it is felt that the average scale in construction work will soon be such as to give real stimulus to building. Jobbers are now feeling some improvement in demand for house-wiring materials, and there is a large amount of work under way which has not reached the wiring stage. The electrical situation as far as industrial plants are concerned is also much healthier than a few months ago. Industrial operations are not expected to be on a large scale this year, but the volume of work now done is so greatly in excess of what has been the rule that all view the future with undisguised optimism. Appliances, however, are reported to be moving very slowly.

Stocks in the hands of the jobbers are found to be slightly larger than last year, because of increased demand,

but they are still closely watched on account of the possibilities of further price reductions. No difficulty is experienced in filling all ordinary requirements immediately from local stores.

Loom.—Demand is spotty, but in general shows improvement. Representative prices are: 7/32-in., $14.80 per 1,000 ft. in 250-ft. lots and $14.40 per 1,000 ft. in 1,000-ft. lots; 1/4-in., $18.90 per 1,000 ft. in 250-ft. lots and $17.75 per 1,000 ft. in 1,000-ft. lots.

Flexible Armored Conductor.—Prices are easier, and the demand, though steady, is not much better than at the first of the year. No. 14, two-wire, is selling for $70 per 1,000 ft. in lots less than 250 ft. and for $50 per 1,000 ft. in lots of 2,500-ft. Connectors sell for $3.60 to $3.75 per 100.

Tape.—Improved demand has reduced the large stocks of a month ago until they are now on a normal basis. The price of rubber tape remains at 36 cents per pound, but that of friction has lowered slightly, now varying from 35 cents to 58 cents, depending upon quality. The most generally used grade of friction tape is selling for around 37 cents.

Entrance Switches and Cut-outs.—Stocks are very conservative because of the comparatively slow demand. Some jobbers report improved sales in St. Louis, but sales throughout the territory are very spotty. In lots of 100 or more a combined entrance switch and cut-out is priced at $36 per 100. Double-pole main cut-outs are priced at $12.70 per 100. Externally operated entrance switches are priced at $1.30 each in lots of twenty-five or more. An all-porcelain switch is on the market for $1 each in any quantity.

Sockets.—Very little change in the demand is noticeable, but there should be improvement when the houses now under construction near completion. Prices for 1/2-in. cap, brushed brass, in lots of 500, are: Key, $18.15 per 100; keyless, $16.50; pull, $33. Porcelain sockets, in lots of 250, are quoted at $25.50 for the key type and at $23 for the keyless. Mica weatherproof sockets, in lots of 250, sell for $10 per 100.

SAN FRANCISCO

A few consecutive days of warm weather following the unusually cold and long winter immediately quickened local buying. A larger proportion of new bungalows now being erected in the outer districts are being wired by ex-wiremen who are usually satisfied if they achieve their former daily wages. Collections are still rather long, running over fifty days, but they are being handled with constantly increasing vigor. Time-payment business has dropped except in one or two conspicuous instances to a mere trickle.

Motors.—A campaign is now being waged to promote the use of fractional hp. motors, and dealers are being urged to search for this business among small industrial consumers such as jewelers, grocers and others. Local stocks are fair, and as many instances of complete shortage have been recently reported there is no doubt that within the next month or so many good stock orders will be placed. The demand for larger motors, especially those of pumping size, is increasing, and with good local stocks and plenty of water for irrigation purposes a good spring motor season is anticipated.

Radio Apparatus.—This new and practically unexploited field is one of the briskest locally. A highly successful campaign to interest the maturer public is being carried on, and at the same time future business is being promoted by public competition for boys' home-made apparatus. New broadcasting stations are being established and already-established service is being perfected. New manufacturers are selling in the local market and new dealers, such as the large department stores are making elaborate preparations to enter the field.

Heating Appliances.—Waffle irons of the new round type will soon be ready for distribution by several manufacturers. One company reports that it is still nearly one thousand irons behind the demand.

Ironers.—There are unmistakable signs that the demand for ironing machines is again approaching its 1920 level after a rather slack year. The character of this demand, however, seems to have changed. There is more shopping and more insistence that the machine shall do a greater proportion, if not all, of the family ironing. Local stocks are good and prices are dropping.

Christmas-Tree Outfits.—Jobbers' salesmen have just received new information and are now closing business for next season. Quite heavy stocks were carried over by jobbers from last year; dealers too are well supplied.

PORTLAND—SEATTLE

Building activity continues unabated throughout the Northwest, residential and apartment-house construction being the most active. The lumber situation remains about the same. Production for the week ending March 11 was 11 per cent below normal, new business was 16 per cent below production, and shipments were 13 per cent above sales. Adverse weather conditions have prevented the opening up of logging operations, but will not act as a hindrance much longer. General business is fair. Electrical jobbers report conditions continuing quiet, although there is apparently no feeling of apprehension about the future. Country business is very spotty. Some activity is reported on high-tension insulators, copper wire and electric ranges. No price changes of any note have occurred during the week, although some instability is evident in porcelain prices. Demands for radio equipment continue unprecedented. Contractor-dealer business is somewhat spotty, some reporting business very good and having figures to prove it. Residence wiring is very active and many large jobs are being placed, but on these the competition is so keen that little profit is left. Dealers cannot get more than 10 per cent of their orders for radio apparatus.

Porcelain.—No. 5½ solid knobs are quoted at $11 per 1,000 in lots of 500. No. 5½ "Nail-it" knobs are $22 to $23.75 per 1,000 in lots of 500. In similar lots and quantities 3-in. x 7/8-in. porcelain tubes are $5.85 to $6.55 and 4-in. x 7/8-in. porcelain tubes are $7.50 to $8.20. Two-wire and three-wire cleats are quoted at $17.50 to $19.25 per 1,000 in lots of 250.

Insulators.—No. 9 pony glass insulators are quoted at $66.45 per 1,000 in lots of 400.

Loom.—7/32-in. loom is quoted at $19 per 1,000 ft. in coil lots of 250 ft.

Electric Ranges.—Ranges are selling more rapidly than any other line of appliance at present.

SALT LAKE CITY—DENVER

The labor situation shows improvement, the railroads having taken back some of their men who have been idle for months, with an indication that they will enlarge the payrolls still further. The coal strike set for April 1 will not affect the Utah mines, since they are not unionized. There is a report current that freight rates on coal will be reduced at the beginning of April, making it possible to lower prices to consumers. The copper outlook continues to grow brighter, with a steadily growing demand. It is estimated that the domestic and foreign markets will absorb upward of 750,000,000 lb. of new refined copper during the first six months of 1922. This will call for a materially increased production. There is scarcely any building activity, the season not being far enough along to permit outdoor construction. However, the real-estate men are active and will launch cottage-building campaigns as soon as the weather permits.

Selling is sluggish in all departments of merchandising and electrical dealers are just marking time, hoping for better times but financially unable to do much in the way of creating business. Jobbers are filling a few small orders for construction materials, washers and vacuum cleaners. The call for pole-line materials is small. Credit conditions show steady though slow improvement. There is far less trouble with collections than was experienced a year ago. Banks are granting loans, but with rigid security demands.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

New Interests Control Diamond Power Specialty

The business of the Diamond Power Specialty Company, Detroit, manufacturer of "Diamond" soot blowers, has been purchased by new interests and a new company has been formed under the name of the Diamond Power Specialty Corporation. The old company was a copartnership, the members of which in selling out have agreed to retire from the soot-blower business in the Western Hemisphere. N. L. Snow, until recently vice-president of the Terry Steam Turbine Company, is now president and treasurer of the Diamond corporation.

Los Angeles Manufacturer Reports Sales Gain

The Pacific Manufacturing & Electric Company of Los Angeles reports that the present market for electric water heaters has shown a decided improvemen during the past few months. In addition to domestic orders, heaters are being sold for export, principally to Japan, where heaters of this type have become popular. The company is planning extensions of its business, which will include the addition of new lines of apparatus. Among other developments being considered is a line of radio receiving apparatus.

American Eveready and National Carbon Consolidate

The sales and accounting divisions of the National Carbon Company, Inc., which have been carried on at Cleveland under that name will, it is announced, be consolidated with the American Eveready Works of the National Carbon Company, Long Island City, N. Y., and the new organization will be operated as the National Carbon Company, Inc. Another change will be the removal of the general offices of the Columbia products division from Cleveland to Long Island City. Warehouses and district sales offices will be maintained at Chicago, Kansas City, Atlanta, Cleveland and Long Island City. Both the Columbia and Eveready products will be handled by all sales representatives, and the personnel of the sales forces of both divisions will be little changed.

J. R. Crawford, who has been general sales manager of the Columbia division of the National Carbon Company, Inc., at Cleveland, has been appointed to the same position with the consolidated organization and will have his headquarters at Long Island City. E. G. Clemenson, formerly assistant general sales manager of the Columbia division, and Emmet Moore, formerly assistant general sales manager of the American Eveready division, will both become assistant general sales managers of the merged organization. F. A. Wilson-Lawrenson, who has been general sales manager of the Eveready division, will have charge of advertising and sales promotion work for all the National Carbon products.

Allis-Chalmers Business Continues to Improve

New business booked by the Allis-Chalmers Manufacturing Company, Milwaukee, in February exceeds that of any month since December, 1920, coming close to $2,000,000, according to information derived from the company. The greater part of the recent business for the company consisted of orders from consumers of small machinery, particularly for machinery used for cement mixing for roads and building construction. A moderate amount of new business is coming from public utility companies, though this end of the business is expected to assume larger proportions later in the year.

The annual statement for 1921 will be published within a few weeks and will show gross earnings for 1921 of about $24,685,000 compared with $31,516,000 in 1920. The unfinished business at the close of the year was $7,300,724 compared with $17,046,724 on Dec. 31, 1920. Thus to attain a gross of $24,685,000 for 1921 the company had to draw on its unfilled orders to the extent of $10,000,000.

General Electric Gets Big Pacific Coast Order

The Southern California Edison Company, Los Angeles, has just placed an order with the General Electric Company involving a total of 455,000 kva. of 220,000-volt transforming equipment, 60,000 kw. of 72,000-volt transformers, a 17,500-kva. generator, a 30,000-kva. synchronous condenser and a considerable amount of switching equipment, including eight 220,000-volt oil circuit breakers. This order is for additional equipment for the Southern California Edison's Big Creek No. 1 power house and the initial equipment for the new receiving substation known as Laguna Belle, and it includes auto-transformers to be used in raising existing stations to the new transmission voltage of 220,000 volts. It is reported that the order will amount to over $1,000,000.

Faden Succeeds Washington Light Company

The Faden Electrical Supply Company, 186 West Lake Street, Chicago, has been organized to succeed the Washington Light Company, formerly at that address. Alex Faden, for the past six years president of the Metropolitan Electrical Supply Company, is president and treasurer of this new company, and Michael Loehr, formerly manager of the Metropolitan company, is the new firm's secretary. Mr. Faden said that while his company would continue in the lighting-fixture business, it would also engage in the electrical supply jobbing business.

Brown & Pengilly Take Over Foulkes Plant

Brown & Pengilly, 607 East Fourth Street, Los Angeles, manufacturers of dead-front switchboards, relays and other control apparatus, have recently acquired the manufacturing plant of the Foulkes Electric Company of Los Angeles and are expanding their activities to meet the rapidly increasing demand for safety switching devices. The rapid growth of California, the expensive program of building construction and new rulings of the California Industrial Accident Commission have combined to widen the market for these classes of equipment. Several new items have been added to the lines formerly made by this concern.

Westinghouse Inaugurates Campaign for Better Street Lighting

An educational campaign in behalf of better street lighting is being conducted by the Westinghouse Electric & Manufacturing Company, with the object of pushing the installation of more street light and particularly of municipal systems of the ornamental type.

The movement has a strong appeal to the civic instincts and civic pride of the people, and favorable comment has already been received from many points throughout the country. Civic officials have been reached through the "direct-by-mail" feature of the campaign, attractive letter-folders pointing out the many advantages accruing to a municipality and its citizens from the installation of a modern lighting system having been sent out in this way. Circularization of persons and organizations interested in the beauty, safety and progress of their respective cities has been carried on on an elaborate scale. Among those being reached by literature are mayors of cities of more than 1,000 population, city commissioners and managers, city engineers, city purchasing agents, superintendents of streets and parks, chairmen of public works boards, etc.

The movement is expected to assist central-station companies in building up lighting loads and to aid others engaged in the electrical industry.

Because of the decrease in the cost

of materials and labor and because of the lower rates at which municipalities may borrow funds, the Westinghouse company feels the present is especially opportune for carrying through a campaign of this kind which stimulates business and promotes progress in the municipality.

Engineering Company Reorganizes

Ophuls, Hill & McCreery, Inc., engineers, 112 West Forty-second Street, New York, have applied for a change in charter to Ophuls, Hill, Inc., the interests of J. H. McCreery having been purchased by the other partners. The firm will continue with the same personnel and in the same location. According to the announcement of the company, Mr. McCreery was never active in the firm, and as an enlargement of its scope and a broadening of its field of activity is contemplated, a change of name was deemed advisable. Fred Ophuls is president and H. P. Hall is vice-president and treasurer.

Coast Campaign for Better Electrical Service Wiring

With the use of electrical energy increasing at the rate of 10 per cent annually and a yearly consumption of energy in Washington, Oregon and California nearly three times as much per capita as for the rest of the United States, the Pacific States Electric Company, realizing the growing importance of electrical energy to the average home owner, has inaugurated an educational campaign along the Coast to establish a basis of confidence between electrical contractor and home owner. The campaign is under way in Seattle and is being conducted under the immediate direction of David E. Harris, vice-president and general manager of the Pacific States Electric Company, San Francisco, and J. D. Barnhill of Evans & Barnhill, Inc., also of San Francisco.

It is contended by those in charge of the campaign that in spite of the rapid growth of the use of electricity in the home most people fail to get the full value of the electrical service to which they are entitled because they have not realized the importance of quality in the original installation. Recent surveys have indicated clearly that the owner often fails to get the service which he may reasonably expect because wiring contracts are let on the basis of price alone. Letting contracts to the lowest bidder, they say, usually means that the work is poorly done. When the bid is too low there must be poor material and poor workmanship to make up for it. It is claimed that the average number of outlets at the present time is only one-half the number required for the best results.

This campaign is said to be the first of its kind to be put into effect in the United States, and much good is expected to flow from it.

Motor Manufacturer Announces Name Change

The Galvin Electric Manufacturing Company is the new name of the company known formerly as the H-G Manufacturing Company, 1215 Pine Street, St. Louis. The company manufactures a line of electrical specialties, including fractional-horsepower motors. According to the company announcement the change in name does not mean a reorganization, and the ownership control, policies and personnel remain as before.

Improvement Last Fall Shown in Worthington Annual Report

Although 1921 considered as a whole proved a year of poor business, according to the annual report of the Worthington Pump & Machinery Company, 115 Broadway, New York, an improvement in the bookings of the company occurred in the latter part of the year, and it is believed this will continue at a slowly increasing rate. Bookings during the year amounted to $12,093,375, while billings were $17,335,854 and profits, after deducting depreciation, were $1,544,309. Unfilled orders on Dec. 31, 1921, were $4,496,232, less than half of those on the Dec. 31 previous.

During the year in the adjustment of contracts for pumping equipment to meet war requirements certain buildings and equipment of the Blake & Knowles Works were taken over from the government. The facilities acquired, it is announced, will be used in the production of recently developed lines, among them a two-cycle solid-injection Diesel engine. Inquiries received for this product, the statement says, have been increasing from month to month and a large volume of business is expected to develop during 1922.

Wisconsin Electric Appliance Succeeds Twin Cities Supply

The Wisconsin Electric Appliance Company, 125 Main Street, Menasha, Wis., has been organized to succeed the Twin Cities Electric & Supply Company and not to operate as a subsidiary of that company, as stated in the ELECTRICAL WORLD last week.

Weber Sales Agent Makes Organization Changes

Henry D. Sears, Boston, Mass, general sales agent for the products of the Weber Electric Company, Schenectady, N. Y., has appointed Henry E. Nickerson, for the past eleven years Mr. Sears's New England representative, to take charge of sales in the metropolitan district of New York and in Connecticut, west of the Connecticut River. Mr. Nickerson will have an office at 342 Madison Avenue, New York. Carl C. Smith, formerly with the Renim Specialty Company, Boston, will have charge of sales in New York State outside of the metropolitan district and all new England except the part of Connecticut under Mr. Nickerson. Henry G. Anschuetz, formerly representing the Manhattan Electrical Supply Company on its manufactured products, will have charge of sales in southern New Jersey, eastern Pennsylvania, Delaware, Maryland and Virginia and will make his headquarters in Philadelphia.

F. B. Colt & Company, contracting engineers, 15-17 West Forty-second Street, New York, have been formed by F. B. Colt, formerly associated with Colt & Brackett.

The Pettingell-Andrews Company, Boston, has established a department for wholesaling radio apparatus. The company will distribute the products of the American Radio Company of New York City.

Ralph M. Setterley, foreign sales manager, has established offices at 149 Broadway, New York, where he will arrange for the foreign representation of American manufacturers of electrical and other products. He is planning a European trip in April.

The Chase-Shawmut Company, Newburyport, Mass., manufacturer of fuses, cut-outs, etc., has appointed the J. S. Jacobson Company, 627 West Jackson Boulevard, Chicago, as Chicago representative. A complete stock will be carried there.

The C. W. Hunt Company, Inc., manufacturer of conveying and other apparatus, West New Brighton, N. Y., has re-established its New York City office at 143 Liberty Street. The company has taken over the sales and engineering work which has heretofore been carried on by its subsidiary, the C. W. Hunt Engineering Company, Inc.

The Apex Electrical Distributing Company, Cleveland, has established a sales promotion department for the northern California territory in conjunction with the Electric Railway & Manufacturers' Supply Company, its representative in that district. B. A. Butterfield, assistant district manager for the Apex products in the Western territory, will have charge of the sales promotion office under the supervisfon of J. B. Fullerton, Western district manager, whose headquarters are in Los Angeles. The San Francisco sales promotion department is at 607 Santa Fe Building.

The Champion Incandescent Light Company, 235 Market Street, Philadelphia, has purchased the building at 635 Market Street. The structure will be occupied as a new plant as soon as alterations are completed.

The Elwood Electric Company is the new name of the company formerly known as the Liddell Electric Manufacturing Company, Inc., 990 Housatonic Avenue, Bridgeport, Conn. The company will retain its present plant.

The Black & Decker Manufacturing Company, Baltimore, has removed its Cleveland office from 6225 Carnegie Avenue to 2030 East Twenty-second Street. The office is in charge of Dan Paul, formerly Pittsburgh manager.

Foreign Trade Notes

NEW ELECTRIC COMPANIES REGISTERED IN CHINA.—Among the new companies to which registration in China has been granted, according to *Electrical Industries*, are the Yang Lu Electric Company, Kiukiang, Kiangsi; the Haiming Electric Company, Kiangsu, and the Shachi Electric Light Company, Shachi. Wang Kionsetsing and others of Hyiao Feng district, Chekiang, purpose to establish an electric light company. The Pekin Electric Light Company, Ltd., has awarded a contract for a 5,000-kw. generator for its new power station at Shihchinshan.

ELECTRICAL EXPORTS TO RUSSIA.—Decided expansion of the Russian market for electrical equipment is predicted at the Department of Commerce. The volume of this business moving to Russia already has attained some proportions. In analyzing exports, however, it is necessary not to lose sight of the fact that many shipments intended for that country are credited to Scandinavian ports.

THE RHEINISCH WESTFAELISCHE ELEKTRICITAETSWERK, Essen, Germany, belonging to the Stinnes group, according to the *Journal of Commerce*, is increasing its capital stock from 150,000,000 marks to 550,000,000 marks for the development of the combined Witte-Stinnes coal-mine interests. Two and one-half million marks of the new shares will be offered to local municipalities and 25,000,000 marks to employees and workmen.

AMERICAN FILM LOSES ELECTRIC CONTRACT IN CHINA.—Because of the more favorable selling terms offered by the British General Electric Company, according to *Commerce Reports*, an American firm lost a contract for power-plant equipment for the Swatow Electric Lighting Company in China. The contract offered by the British firm called for payment of 10 per cent on signing of the contract, 10 per cent on arrival of the machinery, 10 per cent when installed and the rest in six months, with 7 per cent interest on unpaid balances. The erection engineer was to be furnished by the manufacturer without additional cost to the purchaser. The price submitted by the American bidder, it was reported, was substantially the same as that quoted by the British company, but the placing of the business was decided by the more favorable terms offered by the English manufacturer.

DEMAND FOR SMALL ELECTRIC LIGHTING SETS ABROAD.—Compact and simply operated electric lighting sets for household estate or club installation find a good sale, according to *Commerce Reports*, in such countries as India, Ceylon, Mexico and northern Argentina, though just at present the demand is light, owing to unfavorable conditions. The small electric lighting sets, as naturally expected, find their most ready market where central-station service is least developed and where there are large plantations and estates.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An agent in Spain (No. 1,106) desires the exclusive representation of manufacturers of miscellaneous electric supplies and specialties, especially supplies needed for lighting installations in dwellings and office buildings.

A merchant in Norway (No. 1,120) desires an agency for the sale of copper wire for electrical use, copper plates, etc.

An American firm having a travelling representative in Brazil and Uruguay (No. 1,126) desires to represent manufacturers of electrical goods.

A firm of electrical dealers in India (No. 1,133) desires to secure from manufacturers the sole representation for the sale of electrical apparatus.

An importing firm in Belgium (No. 1,137) wishes to purchase electrical apparatus for medical purposes and heating and general electrical material for high-tension and low-tension transmission, generators, motors, transformers, rotary and lever interrupters, etc.

A firm of engineers in the United States, having connection with importers in Great Britain and France, desires to secure the representation of firms manufacturing electrical specialties.

CABLE FOR MORWELL (AUSTRALIA) POWER SCHEME.—Tenders will be received by the State Electricity Commission of Victoria, Melbourne, Australia, until April 29, under specification No. 200, for 22,000-volt, three-core cable and accessories. Copies of tender form and specification may be had upon application to the Bureau of Foreign and Domestic Commerce, Department of Commerce, First National Bank Building, Chicago, and 734 Custom House, New York City, and also at the office of the Commissioner for Australia in the United States, Room 3012, 61 Broadway, New York City. Tenders are to be addressed to R. Liddlelow, secretary, 673 Bourke Street, Melbourne, Victoria, Australia.

PATENT RIGHTS OFFERED FOR AN ELECTRIC FURNACE.—An Italian engineer who has patented an electric arc furnace in the United States desires to sell American rights. Any American manufacturer interested in studying the specifications of the patent and desiring to get in touch with the inventor may receive the necessary information from the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce, Washington, D. C., by referring to miscellaneous exhibit No. 239.

New Apparatus and Publications

MOTORS.—Bulletin No. 284, issued by the B. F. Sturtevant Company, Hyde Park District, Boston, describes its new line of polyphase squirrel-cage induction motors.

FILAMENT WINDING MACHINE.—The General Engineering & Supply Company, 160 Fifth Avenue, New York City, consulting engineers, has developed a new "Gesco" filament winding machine.

CIRCUIT BREAKER.—The Condit Electrical Manufacturing Company, South Boston 27, Mass., has developed a new oil circuit breaker, known as type D-22. It can be furnished in sizes up to and including 1,200 amps. for 15,000-volt service.

BLOWER AND VACUUM PUMP.—Bulletin No. 74, issued by the Central Scientific Company, 460 East Ohio Street, Chicago, covers its "Cenco" (electrically driven) rotary blower and vacuum pump combined.

EXTRACTION APPARATUS.—The Central Scientific Company, 460 East Ohio Street, Chicago, is distributing bulletin No 94, describing its new pickel ("Cenco" built) electric extraction apparatus.

ILLUMINATOR.—The Central Scientific Company, 460 East Ohio street, Chicago, is distributing a leaflet describing the "Silverman" illuminator, "A New Eye for the Miscrope." It is intended for use in miscropic examinations and photographing of opaque and semi-opaque objects.

SPECIFIC GRAVITY SCALES.—The Central Scientific Company, 460 East Ohio Street, Chicago, has issued a four-page leaflet describing its specific gravity "Chainomatic" balance scale, with case, for liquids.

WIRE.—"Hazard Keystone Wire" is the title of a small booklet issued by the Hazard Manufacturing Company, Wilkes-Barre, Pa., covering the "Hazard" insulated copper wire.

WOODWORKING MACHINERY.—The Hutchinson Manufacturing Company, Norristown, Pa., is distributing a six-page folder entitled "What Shall We Name It?" covering a new electrically driven combination woodworking machine recently placed on the market by the company.

EQUIPMENT TEST BENCH.—Paul G. Neihoff & Company, Inc., 232-242 East Ohio Street, Chicago, is distributing a leaflet describing its "A. E. S." equipment test bench.

GALVANIZED-IRON WIRE.—"Double-Galvanized Steel Strand and Iron Wire for Electrical Transmission and Distribution" is the title of a booklet published by the Indiana Steel & Wire Company, Muncie, Ind., in which it gives information concerning the use of double-galvanized iron wire an steel strand for transmission purposes.

CODE.—The Greenfield Tap & Die Corporation, Greenfield, Mass., has published a comprehensive telegraph and cable code designed to cut down the expenses of those of its customers ordering by wire.

SWITCH.—A new type of manually operated, non-automatic, single-throw horn-gap switch for outdoor service has recently been placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh Pa.

THERMOMETERS.—"How Far Can You Read It?" is the title of a folder issued by the Foxboro Company, Inc., Foxboro, Mass., describing the "Foxboro" thermometers.

CORD.—A small four-page folder, known as publication 2,056, issued by the Cutler-Hammer Manufacturing Company, Milwaukee, describes the C-H appliance cord recently put out by the company.

WASHERS.—The Kales Stamping Company, 1659 West Lafayette Boulevard, Detroit, is distributing a four-page leaflet giving a list of sizes of special washers, in any gage and any material.

FITTINGS AND DEVICES.—The Erie Electrical Equipment Company, Johnstown, Pa., is distributing a catalog covering the "Erie" fittings and devices.

INSURANCE.—The Travelers Indemnity Company, Hartford, Conn., is distributing a folder entitled "Engine Insurance," calling attention to plant protection by its insurance methods.

FIXTURES.—The Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago, is distributing two catalogs, Nos. S-6 and D-7. The first contains 128 pages, covering its complete line of "S," "C" and "Baby Denzar" lighting fixtures. The other describes its commercial lighting equipment for store, office and school lighting.

New Incorporations

THE DUNBAR LIGHT & POWER COMPANY, Charleston, W. Va., has been incorporated by J. H. McClintic, W. G. Matthews, G. F. Skidmore, W. H. Truslow and P. J. Newlon, Charleston. The company is capitalized at $50,000.

THE DAMASOUE POWER COMPANY, Youngstown, Ohio, has been incorporated with a capital stock of $500 by W. J. Smith, J. Howard Bothwell, G. F. Hammond and others.

THE ORANGEBURG N. E. SUBURBAN LIGHT & WATER COMPANY, Northeast Orangeburg, S. C., has been chartered with a capital stock of $1,000. The officers are: F. L. Lyons, president; C. C. Holman, treasurer; S. E. Middleton, secretary, and J. R. Fordham, general manager.

Record of Electrical Patents

Notes on United States Patents

(Issued Feb. 28, 1922)

1,408,403. ELECTRIC HEATING DEVICE; Edwin H. Ruehl and Arthur L. Ruehl, St. Louis, Mo. App. filed April 15, 1921. Element inclosed in metal case.

1,408,406. MOUNTING FOR ELECTRODES WITH COOLED METALLIC HEADS; Curt Schraepler, Essen-on-the-Ruhr, Germany. App. filed March 25, 1914. Furnace electrodes.

1,408,418. ELECTRODE WITH COOLED METALLIC HEAD; Martin Sperling, Essen-on-the-Ruhr, Germany. App. filed Aug. 25, 1913. Furnace electrodes.

(Issued March 7, 1922)

1,408,426. ELECTRICAL PROPULSION OF SHIPS; Albert Aichele, Baden, Switzerland. App. filed Sept. 30, 1919. Synchronous motor with direct-current winding for starting.

1,408,435. MINER'S BLASTING BATTERY; Joseph S. Beeneck, Nanticoke, Pa. App. filed July 10, 1919. Mounted in waterproof casing.

1,408,446. TELEGRAPHY; Thomas B. Dixon, Brooklyn, N. Y. App. filed Jan. 15, 1920. Compensation of distortion by shunts.

1,408,525. ELECTRIC BATTERY; William R. Loveman, Bridgeport, Conn. App. filed July 31, 1920. For flashlights.

1,408,526. POCKET FLASHLIGHT; Anker S. Lyhne, Bridgeport, Conn. App. filed July 19, 1920. Pencil size.

1,408,527. FLASHLIGHT; Anker S. Lyhne, Bridgeport, Conn. App. filed Oct. 18, 1920. Bulb at right angles to battery.

1,408,528. FOCUSING DEVICE FOR ELECTRIC LAMPS; Anker S. Lyhne, Bridgeport, Conn. App. filed Feb. 12, 1921. Hand adjustment for flashlights.

1,408,534. TROLLEY-POLE HOLDER FOR STREET CARS; Regas Regopulos, Milwaukee, Wis. App. filed Dec. 8, 1921. To prevent pole from swinging upward.

1,408,540. SIGNALING SYSTEM; Frank M. Slough, Rochester, N. Y. App. filed March 3, 1919. Automatic telephone ringing.

1,408,555. ART OF PRODUCING STEP-BY-STEP MOVEMENTS; Frank W. Wood, New York, N. Y. App. filed Nov. 13, 1918. For ship telegraph signaling.

1,408,559. PANORAMIC X-RAY APPARATUS; Alvin F. Zulauf, Brooklyn, N. Y. App. filed Jan. 7, 1920. For obtaining dental shadow photographs.

1,408,567. TRANSMISSION EQUALIZATION ARRANGEMENT; Leo H. Darrow, Brooklyn, N. Y. App. filed Dec. 23, 1920. Constant-current vacuum tube for telephone circuits.

1,408,579. STORAGE-BATTERY GRID; Arthur O. Garrett, San Diego, Cal. App. filed Oct. 27, 1920.

1,408,600. TROLLEY-POLE HEAD; William T. Jones, Panther, W. Va. App. filed Nov. 16, 1921. Feed wire to controller bolted to wheel bracket.

1,408,601. SAFETY TRANSFER-CABLE REEL AND TROLLEY-POLE SWITCH; William T. Jones, Panther, W. Va. App. filed Nov. 16, 1921. Mine locomotive gathering reel.

1,408,611. OPERATING MECHANISM; Chester W. Larner, Philadelphia, Pa. App. filed March 9, 1918. Solenoid operates hydraulic valves.

1,408,618. CHROMIC-ACID REGENERATION; Ralph H. McKee, New York, N. Y. App. filed Sept. 4, 1919. By electrolytic process from waste liquids

1,408,625. METHOD OF NITROGEN FIXATION; Casper W. Miles, Anderson Township, Hamilton County, Ohio. App. filed July 22, 1918.

1,408,634. WATER HEATER; Alphonso F. Passmore and Ernest B Fletcher, Toronto, Can. App. filed Oct. 25, 1920. Instantaneous type; water coils incircle element.

1,408,639. ARMATURE WINDING MACHINE; Philip F. Rhoades, New York, N. Y. App. filed Oct. 22, 1920. For small armatures.

1,408,648. TELEPHONE TRANSMITTER; Michael Setter, Chicago, Ill. App. filed March 19, 1917. Bridge and face plate held together by friction.

1,408,664. FLASHLAMP; Frederick W. Wakefield, Vermilion, Ohio. App. filed March 29, 1920. Pocket flashlamp.

1,408,758. OPERATION, REGULATION AND CONTROL OF DYNAMO-ELECTRIC MACHINES; Friedrich W. Meyer, Milwaukee, Wis. App. filed Jan. 21, 1918. Converts direct current to alternating current.

1,408,759. BATTERY TESTER; John H Miller, Oak Park, Ill. App. filed July 1, 1920. For making cadmium voltage tests.

1,408,777 and 1,408,778. X-RAY ANGLE INDICATOR; Howard R. Raper, Albuquerque, N. M. App. filed Jan. 3, 1921. Indicates angles and indicia in dental radiography.

1,408,784. RINGING REGULATOR; John F. Toomey, New York, N. Y. App. filed Sept. 17, 1918. Automatic ringing on telephone.

1,408,805. ARC-WELDING SYSTEM; Claude J Holslag, South Orange, N. J. App. filed Sept. 2, 1920. Uses alternating current.

1,408,838. TRANSMISSION OF ELECTRIC ENERGY TO MOVABLE ELEMENTS; Erik G. Sohlberg, Schenectady, N. Y. App. filed April 27, 1920. Endless conductor on pulleys fastened to crane.

1,408,844. SPEED REGULATION OF ALTERNATING-CURRENT MOTORS; Louis W. Thompson, Schenectady, N. Y. App. filed July 10, 1918. Auxiliary winding for changing flux.

1,408,860. TROLLEY STABILIZER; Charles B. Branson, Lincoln, Neb. App. filed Sept. 13, 1921. To prevent trolley leaving wire at curves.

1,408,920. BURGLAR ALARM; Fred L. Anderson, Kansas City, Mo. App. filed May 12, 1919. Foot operated for banks, stores, etc.

1,408,931. DYNAMO-ELECTRIC MACHINE; Thomas L. R. Cooper and James C. Todman, London, England. App. filed Nov. 21, 1918. All field laminations in one piece.

1,408,953. VARIABLE-RESISTANCE UNIT; Stanley L. Law, St. Paul, Minn. App. filed Jan. 17, 1919. Attachment prevents burning out by lightning.

1,408,989. X-RAY APPARATUS; William D. Coolidge, Schenectady, N. Y. App. filed Jan. 24, 1919. Portable generator.

1,408,992. VARIOMETER; Joseph W. Doron, Hamilton, Ohio. App. filed Feb. 14, 1921. Variable inductance for radio communication.

1,409,019. ELECTRICAL HEATING DEVICE; Michael S. Parnell-Smith, London, England. App. filed Oct. 11, 1920. Element inclosed in inert gas chamber.

Construction News

Projects, Plans, Bids and Contracts Contemplated or Under Way

New England States

CANTON, ME.—At a recent town meeting it was voted to accept the proposal of the Rumford Falls Light & Power Company to extend its transmission line from Rumford to Canton to furnish electrical service here.

EAST EDDINGTON, ME.—Steps have been taken by residents of East Eddington, East Holden and Clifton to organize a company to erect and operate an electric transmission line to supply electricity to the three towns. It is proposed to secure electrical energy from the Bangor Railway & Electric Company.

MERRIMAC, N. H.—The Amoskeag Manufacturing Company, Manchester, is planning to build a hydro-electric plant on the Merrimac River at Mooars Falls, to cost about $2,000,000.

AYER, MASS.—The Ayer Electric Light Company will construct a substation on Park Street.

BOSTON, MASS.—The Boston Elevated Railway Company is planning to erect an addition to its power plant on First Street, to cost about $900,000, including equipment. Dwight P. Robinson & Company, 61 Broadway, New York, are engineers.

PROVIDENCE, R. I.—A two-story power house, 45 ft. x 60 ft., will be erected by the Colwell Worsted Company at its new mill buildings on Hartford Avenue, which will be equipped for electrical operation. The C. I. Bigney Construction Company, 357 Westminster Street, is contractor.

NEW BRITAIN, CONN.—The American Hosiery Company, Park Street, is preparing plans for the construction of a one-story power house, 40 ft. x 52 ft. Reeds & Thorpe, 60 Prospect Street, Hartford, Conn., are engineers.

Middle Atlantic States

ALBANY, N. Y.—Bids will be received by Charles L. Cadle, superintendent of public works, Capitol, Albany, until April 11, under terminal contract No. 122, for furnishing and installing two 5-ton electric gantry cranes on barge canal terminals, one each at Rochester and Syracuse.

ALBANY, N. Y.—The Municipal Gas Company contemplates extensions to its electric power plant and system, to cost $955,000. Application has been made to the Public Service Commission for permission to issue $955,000 in bonds for the work.

BATAVIA, N. Y.—The Council has awarded contract to the Genesee Light & Power Company to install a street-lighting system from the city line to the Pembroke town line, on the Buffalo-Batavia highway.

BUFFALO, N. Y.—An electric pumping plant and other electric equipment will be installed at the new filtration plant for the municipal waterworks, for which an appropriation of $4,500,000 has been voted. George G. Andrews is water commissioner.

FREEPORT, N. Y.—The Board of Trustees has approved the report of engineers for extensions and improvements to the municipal electric light plant, involving an expenditure of about $150,000. The proposal to issue bonds for the work will be submitted to the voters.

ITHACA, N. Y.—The Board of Directors, City Hospital, will build an addition to the power house at the institution. Gibb & Waltz are architects.

MALONE, N. Y.—The Malone Light & Power Company has filed application with the Public Service Commission for permission to build two power stations at Waverly and Dickinson, N. Y., respectively.

NEWSTEAD, N. Y.—The Council has contracted with the Genesee Light & Power Company, Batavia, to install a street-lighting system on the main state road from Clarence to Pembroke and on the Grant Road.

DOVER, N. J.—The New Jersey Power & Light Company will build a transmission line from Hamburg to Sussex, to connect with the system of the Woodbourne (N. J.) Electric Company, recently acquired.

MONTCLAIR, N. J.—A power and refrigerating plant will be installed by the Montclair Rink & Ice Company at its new skating rink, estimated to cost $200,000. George W. Backoff, 9 Clinton Street, Newark, N. J. is architect.

TRENTON, N. J.—The annual appropriation bill, now before Governor Edwards for approval, provides a fund of $275,000 for a power plant and other work at the State School for the Deaf, Trenton Junction. The power plant will cost about $175,000 and will be built early in 1923. The State Board of Education is in charge.

KANE, PA.—The Keystone Power Company contemplates the installation of two generating units, one this year and the other during 1923.

LITTLESTOWN, PA.—A central power house, to cost about $35,000, will be erected by the Hoffman Orphanage. Kast & Kelker, 222 Market Street, Harrisburg, Pa., are architects.

PLYMOUTH, PA.—The Luzerne County Gas & Electric Company has issued $1,000,000 in bonds, part of the proceeds to be used for extensions and improvements.

PHILADELPHIA, PA.—The John T. Lewis & Brothers Company, Lafayette Building, will erect a two-story power house at its paint factory, to cost $60,000.

PHILADELPHIA, PA.—The Philadelphia Electric Company will commence work at once on an addition to its plant at Beach and Palmer Streets, for the installation of a 30,000-kw. generating unit, increasing total output to 90,000 kw. The company has contracted with the Municipal Transit Department to furnish and install cables and equipment for service for the Frankford elevated line from the central station to cost $150,000.

PITTSBURGH, PA.—The West Penn Railway Company has increased its capital stock from $20,000,000 to $30,000,000, part of the proceeds to be used for extensions and improvements to its electric system.

PITTSBURGH, PA.—The Duquesne Light Company has been granted permission by the Public Service Commission to acquire the property and franchises of the Pittsburgh-Beaver Light Company, which it will consolidate with its system.

SCRANTON, PA.—A power plant to cost $150,000 will be erected by the Scranton Lace Company, Albright Street. Lockwood, Greene & Company, 101 Park Ave., New York City, are engineers.

SHARON, PA.—The Pennsylvania-Ohio Power & Light Company is planning the installation of equipment at its Lowellville plant. A number of lines will be built to serve industrial plants in this district, to approximately, with rural line extensions, more than 150 miles.

SHREWSBURY, PA.—The plant of the Deer Creek Light & Power Company has been purchased by the Glen Rock (Pa.) Electric Light & Power Company. The new owner will make extensions and will connect the lines with its system.

WILKES-BARRE, PA.—The Wilkes-Barre Light Company is being reorganized and plans to install and operate a light and power system in this district.

WILMINGTON, DEL.—A one-story power house, 95 ft. x 150 ft., will be erected by the Wilmington Sugar Refining Company at its sugar mill at Christiana Avenue and B Street. W. J. Wayte, Inc., 125 East Forty-sixth Street, New York City, is engineer.

HAGERSTOWN, MD.—The offer of the Hagerstown & Frederick Railway Company to furnish electric service for the city has been rejected by the Board of Street Commissioners, and plans for the extension of the municipal plant will soon be started.

PATUXENT, MD.—A power house will be constructed by the Patuxent Clay Products Company, 210 Equitable Building, Baltimore, Md., in connection with its new local plant, to cost about $100,000.

CHARLESTON, W. VA.—The Ray-Burdette Coal Company is planning the installation of a new engine-generator set, etc., at its properties.

LUNDALE, W. VA.—The Lundale Coal Company, operating at Three Forks, near Lundale, is planning to equip its entire plant for electrical operation. The entire cost is estimated at about $1,000,000. George M. Jones is general manager.

CHARLOTTESVILLE, VA.—Officials of the Union Bank, Richmond, Va., have acquired the electric light and power and cold storage plant of the Carter Corporation, at Crozet, near Charlottesville. The new owners contemplates improvements in the plant and will resume operations at an early date.

CLIFTON FORGE, VA.—A bond issue for $240,000 for the construction of a municipal electric plant has been approved by the citizens.

CROZET, VA.—The Crozet Cider Company is planning rebuilding the portion of its plant, including power and engine house, recently destroyed by fire.

North Central States

DETROIT, MICH.—The Detroit Edison Company contemplates extensions and improvements to its system during the spring, to cost about $2,000,000.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, Room 219, City Hall, Cleveland, until March 28 for ornamental glass globes for park and boulevard lamps for the street-lighting division.

DAYTON, OHIO.—A power house will be established by the Terminal Cold Storage & Ice Company in connection with its proposed ice and cold-storage plant at Baker and Ludlow Streets, to cost $500,000. The George B. Bright Company, 103 Marquette Building, Detroit, Mich., engineer.

ONTARIO, OHIO.—The Rural Electric Service Company, Shelby, Ohio, will build a new transmission line to Ontario. R. M. Mead Company, Shelby, is engineer.

SHELBY, OHIO—The Huron Valley Light & Power Company contemplates the construction of a new transmission line. The R. M. Mead Company, Shelby, is engineer.

JACKSON, KY.—The Carbon Coal Company, recently organized, is planning the construction of an electric power plant. Emory Cain is general manager.

LOUISVILLE, KY.—A power house, electric pumping equipment, air compressors, etc., will be installed at the new local plant to be constructed by the Producers' Wood Preserving Company, affiliated with the Ayer & Lord Tie Company, Railway Exchange Building, Chicago, Ill., estimated to cost $100,000. Russell Lord is president.

INDIANAPOLIS, IND.—Arrangements have been made by the Interstate Public Service Company for the construction of a large hydro-electric plant on the St. Joseph River at Mottville, Mich.

LAFAYETTE, IND.—The Northern Indiana Gas & Electric Company, South Bend, Ind., has been granted permission by the Public Service Commission to purchase the property of the Lafayette Public Service Company.

ASTORIA, ILL.—Plans are being prepared by the Canton Architectural Company, Canton, for the construction of a coal-mine tipple, power house, railroad tracks, scales and cable for a company now being formed. The cost is estimated at $300,000.

LISLE, ILL.—The Benedictine Convent, care of Shattuck & Layer, architects, 19 South La Salle Street, Chicago, is having plans drawn for the construction of a power house at the institution, 45 ft. x 106 ft.

MARENGO, ILL.—The Elgin & Marengo Railroad Company will erect a one-story power plant, 42 ft. x 105 ft., in Marengo.

MATTOON, ILL.—The Central Illinois Public Service Company has issued $1,500,000 in bonds, the proceeds to be used for the construction of a steam-driven electric plant in the coal fields of southern Illinois.

MANAWA, WIS.—The Little Wolfe River Lumber Company has plans under way for the construction of a hydro-electric power plant. Thomas W. Orbison, Appleton, Wis., is engineer.

AUSTIN, MINN.—The Water & Light Board is preparing plans for rebuilding the municipal power plant, to cost about $100,000. A. L. Pillsbury, 1,200 Second Avenue, South, Minneapolis, Minn., is engineer.

GRAND FORKS, N. D.—The Red River Power Company contemplates improvements to its system, including the installation of a 2,000-kw. turbine and laying a 20-in. pipe line from the plant to Red River. The cost is estimated at $125,000. W. H. Brown is manager.

ALVO, NEB.—The Council has engaged the Hollister Engineering Company, 517 Bankers' Life Building, Lincoln, Neb., to prepare plans for the construction of an electric lighting system in Alvo.

Southern States

ASHEVILLE, N. C.—The North Carolina Electric Power Company contemplates the installation of a new turbine unit at its hydro-electric plant at Weaverville and extensions to its steam-operated plant at Elk Mountain, to cost about $250,000.

CHARLOTTE, N. C.—The Southern Power Company is securing estimates of cost for a new steel-tower transmission line in connection with its hydro-electric development at Mountain Island.

SANATORIUM, N. C.—The North Carolina Tubercular Sanatorium is having plans prepared for the erection of an addition to its power house, to cost $80,000. H. A. Underwood, Raleigh, N. C., is engineer.

DOBSON, N. C.—C. C. Hutchens and associates are organizing a new company to construct and operate a hydro-electric power plant near Dobson.

ATLANTA, GA.—The Georgia Railway & Power Company has issued $150,000 in bonds, part of the proceeds to be used for extensions and betterments.

MANCHESTER, TENN.—The Public Light & Power Company contemplates the erection of a new transmission line. G. B. Adams is treasurer.

SAVANNAH, TENN.—The town officials are considering establishing electric light and ice plants, to be operated by water power. The plans include the construction of a concrete dam and installation of a turbine waterwheel. A. M. Patterson is chairman of committee.

AMORY, MISS.—The Council will receive bids until March 31 for the construction of a municipal electric power plant. F. G. Proutt, Randolph Building, Memphis, Tenn., is consulting engineer. E. E. Cowley is city clerk.

ELTON, LA.—An election will be held in April to vote on the proposal to issue $40,000 in bonds for the installation of lighting and water systems.

NEW ORLEANS, LA.—The Citizens' Light & Power Company, recently organized with a capital stock of $2,000,000, is planning to build a power plant at Carrollton, near New Orleans.

WELEETKA, OKLA.—The Council is preparing plans for a municipal electric light and power plant, and an electrically operated pumping plant for the waterworks, for which a bond issue of $215,000 has been approved. W. V. Long & Company, Colcord Building, Oklahoma City, Okla., are engineers.

DALLAS, TEX.—The Pacific Avenue Improvement Association will soon submit plans for the installation of an ornamental lighting system on Pacific Avenue to the Council. Harry A. Olmstead is chairman.

RALLS, TEX.—The Council is negotiating with the Texas Utilities Company, Lubbock, Tex., to extend its transmission line to Ralls, for local service.

ROBSTOWN, TEX.—The Robstown Gin & Ice Company will install new generating equipment at its power plant and will equip its cotton-ginning plant for electrical operation.

VERNON, TEX.—The Council will submit a proposition to voters at the municipal election, April 4, whether to construct a new electric plant or purchase the local station of the Texas Public Service Company. Bonds for the new plant recently were voted.

Pacific and Mountain States

KELSO, WASH.—The Spirit Lake Railway & Power Company, Vancouver, Wash., has applied to the Federal Water Power Commission for permission to develop water power on the Toutle and Green Rivers in the State of Washington. A permit to develop 17,000 hp. is asked.

SPOKANE, WASH.—The Mount Spokane Power Company is planning for the erection of an addition to its power plant on the Little Spokane River, near Milan. M. F. Mendenhall is president.

TACOMA, WASH.—The Council has approved an ordinance for the installation of ornamental lamps standards on Tacoma Avenue from Centre Street to Division Avenue.

TACOMA, WASH.—A federal permit has been granted to Henry J. Pierce, president of the Washington Irrigation & Development Company, for the development of the Priest Rapids dam. The total cost of the project is placed at $40,000,000.

VANCOUVER, WASH.—The Northwestern Electric Company has been granted permission by the Federal Water Power Commission for a hydro-electric development near Amboy.

COTTAGE GROVE, ORE.—The Mountain States Power Company, Albany, is reported to have purchased the property of the Cottage Grove Electric Company. The former company plans to erect a 11,000-volt transmission line to connect with its plant at Springfield, which will be the terminus of the 110,000-volt line of the California-Oregon Power Company.

PORTLAND, ORE.—The Pacific Power & Light Company is considering the construction of a hydro-electric generating plant on the Deschutes River, near Bend.

SALEM, ORE.—The Willamette Valley Flax & Hemp Company contemplates the construction of a hydro-electric plant on the North Santiam River.

WALLOWA, ORE.—The Nibley Minnaugh Lumber Company is planning construction of a hydro-electric plant.

CLARKSBURG, CAL.—The Great Northern Power Company plans the construction of a transmission line 15 miles long, to cost about $50,000.

EL CERRITO, CAL.—The Great Western Power Company, San Francisco, will soon break ground for the erection of a substation, to cost about $125,000.

PATTERSON, CAL.—The Board of Trustees is considering the installation of an ornamental lighting system in the business district.

SACRAMENTO, CAL.—At an election to be held March 28 the proposal to issue $45,000 in bonds for the installation of an electric distributing system in the Carmichael district will be submitted to the voters. A. D. McDonnell 2,601 S Street, is member of board of directors.

SACRAMENTO, CAL.—Plans are under consideration for the construction of a hydro-electric plant on the South Fork of the American River to supply electricity for lamps and motors at Camp Sacramento. A. Givan is city engineer.

SAN LUIS OBISPO, CAL.—The Midland Counties Public Service Corporation will erect a 60,000-volt transmission line from San Miguel to San Lucas, a distance of 25 miles, along the Salinas River to furnish electricity for irrigation purposes in the lower Salinas Valley. The total cost of the line is estimated at $100,000.

TULARE, CAL.—The Southern California Edison Company contemplates extensions and improvements in the Tulare district during 1922, to cost about $498,000. The work will include water-power development in the mountains, new transmission lines, distribution lines, substations, etc. J. R. Haskins is district manager.

WEAVERVILLE, CAL.—The Board of Supervisors has granted W. H. Samson, Corning, a franchise to erect electric transmission lines on the highways and streets of Trinity County. Mr. Samson recently located several water-power rights in Stuart's Fork River and its tributaries.

BILLINGS, MONT.—Plans have been prepared for the construction of a dam across the Yellowstone River and a hydro-electric plant at Buffalo Rapids, to be equipped with eight horizontal turbines, capable of developing 27,000 hp. at high-water periods. Alvin C. Leighton is at the head of the project.

YODER, WYO.—Application has been made to the State Public Service Commission by E. P. Bacon, general manager of the Natrona Power Company, Casper, and others for a certificate of convenience and necessity to erect an electric transmission line to the new town of Yoder. This project would connect with the transmission line of the United States Reclamation service from the Guernsey dam and would supply electricity for farmers and ranchers along the right-of-way.

ELKO, NEV.—The Elko-Lamoille Power Company contemplates improvements to its plant, including the erection of a new power station, installation of a 250-hp. engine, etc. The cost is estimated at $50,000.

Canada

MONTREAL, QUE.—The Montreal Public Service Corporation, it is understood, contemplates the development of water power on the Kipawa River in Pontiac County, where it is estimated that 90,000 hp. can be developed. This corporation, it is said, has applied for permission to erect transmission lines in twenty-three counties in Quebec Province.

LONDON, ONT.—Improvements are contemplated to the street-lighting system, for which, it is understood, that from $60,000 to $75,000 will be available.

BRIDGEBURG, ONT.—A committee has been appointed by the Town Council to negotiate with the Hydro-Electric Power Commission of Ontario regarding extending its transmission line into Bridgeburg. The commission will soon begin work on a line from Chippawa to Stevensville, which will almost touch the town.

OTTAWA, ONT.—The installation of a police signal system and fire-alarm box, to cost about $30,000, is under consideration. A. F. Macallum is city engineer.